Railway Engineering Maintenance

"HOLDING THE RAIL IS MY YEAR 'ROUND JOB, BUT THIS IS TO WISH YOU A HAPPY NEW YEAR"
I'M HELD BY THE GRIP THAT HOLDS
THE IMPROVED FAIR RAIL ANCHOR
1942

Reliance HY-CROME Spring Washers

★Reliance HY-CROME *Spring Washers*, A QUALITY PRODUCT produced on a quantity basis under most modern scientific conditions. In Fabricating Plant #1 (the birth-place of the HY-CROME family) spring tension devices to cope with every bolt problem are manufactured for every railroad requirement.

HY-CROME Pressure Spring

Hy-Pressure HY-CROME

Double HY-CROME

HY-CROME Springlocks

EATON MANUFACTURING CO. RELIANCE SPRING WASHER DIVISION, MASSILLON, OH

Sales Offices New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

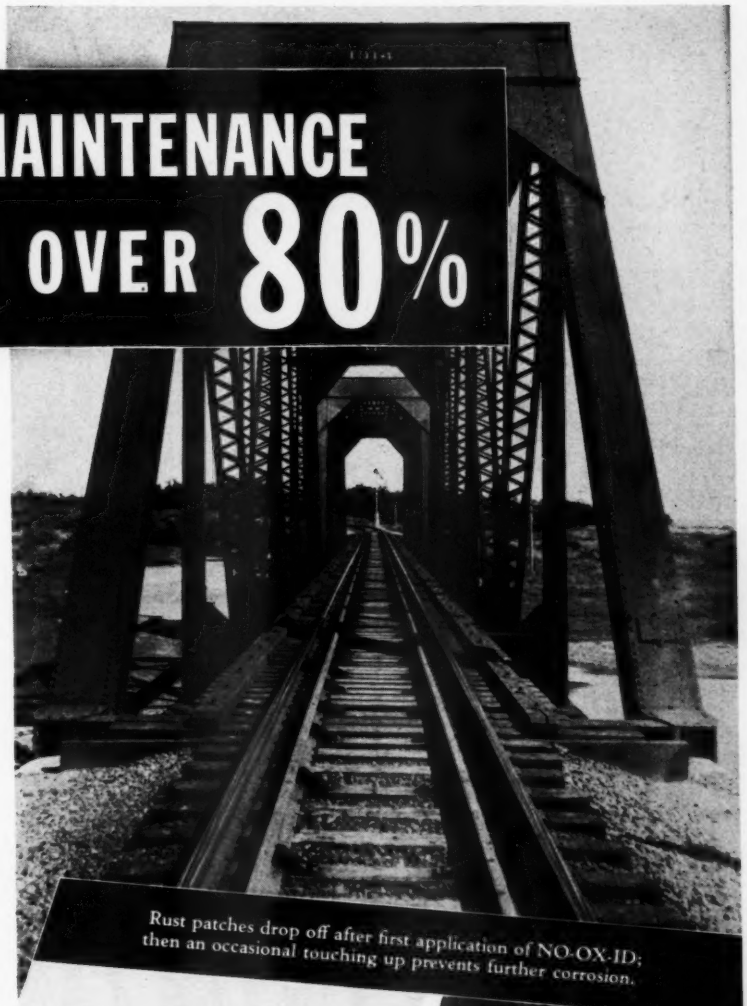
COST OF MAINTENANCE REDUCED OVER 80%

and loss of metal stopped!..

● By standardizing on NO-OX-ID, the average annual maintenance cost over a number of years on steel bridges of various types, reported by one railroad, was reduced to 57¢ per ton.

All bridges are located in salt water districts where atmospheric conditions are very corrosive. NO-OX-ID can be applied over rusted surfaces without extensive pre-cleaning. In addition to bridges, it is used to protect turntables, rail joints, track scales, tanks, steel structures, pipe lines, etc. The Dearborn Engineer in your district is in possession of maintenance cost data which will be interesting to you. Write us and we'll gladly have him see you.

DEARBORN
CHEMICAL COMPANY
Dept. U, 310 S. Michigan Ave., Chicago
New York • Los Angeles • Toronto



Rust patches drop off after first application of NO-OX-ID; then an occasional touching up prevents further corrosion.

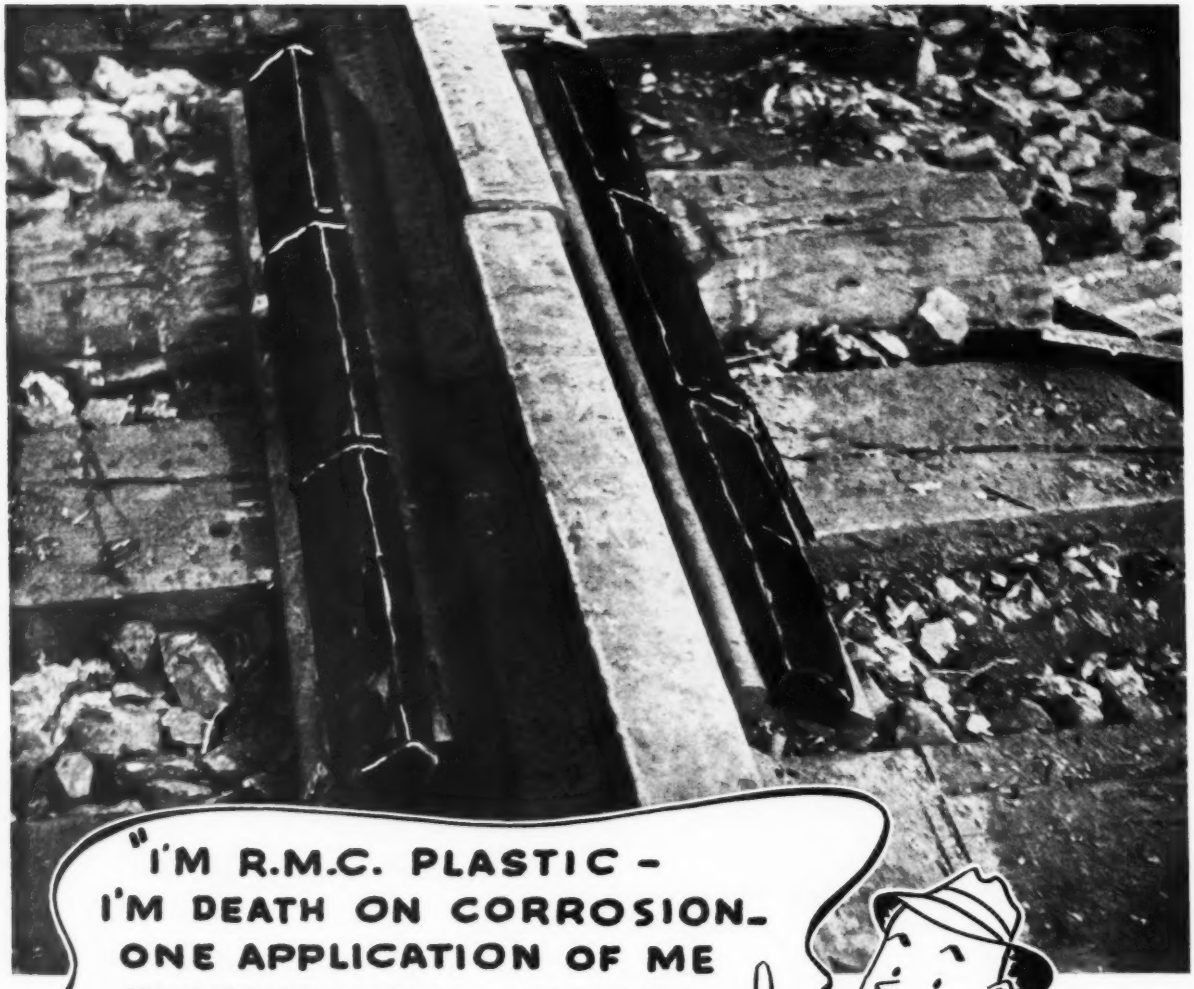
Loss of metal cannot go on when NO-OX-ID is used.

Pre-cleaning not necessary when applying NO-OX-ID.

NO-OX-ID can be brushed over rusted surfaces by low cost labor. May be sprayed if desired.

NO·OX·ID
IRON + OX = RUST
TRADE MARK
The Original Rust Preventive

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.



"I'M R.M.C. PLASTIC - I'M DEATH ON CORROSION - ONE APPLICATION OF ME PROTECTS RAIL JOINTS FOR LIFE!"

Corrosion at the joints has prematurely ended the service life of many rails.

Yet, only *one application* of RMC Plastic is needed to give rail joints *complete, permanent* protection from all corrosive agencies.

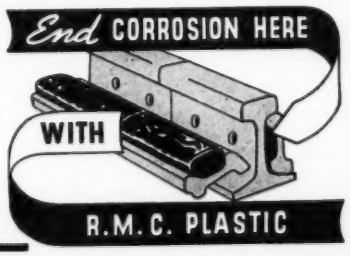
So effective is this plastic that, 10 years after packing with it, joint assemblies are 100% corrosion-free.

And the *lubricating* qualities of the plastic are just as permanent and effective.

With the joints well lubricated and corrosion-free, the rails cannot "freeze", but are free to expand and contract uniformly. The main cause of excessive rail end batter is thus eliminated.

Investigate RMC Plastic NOW—its low cost will interest you.

Molded blocks of R. M. C. Plastic are placed on the inner faces of the joint bars before they are bolted to the rail, the bolting action solidly packing the plastic into every section of the joint assembly.

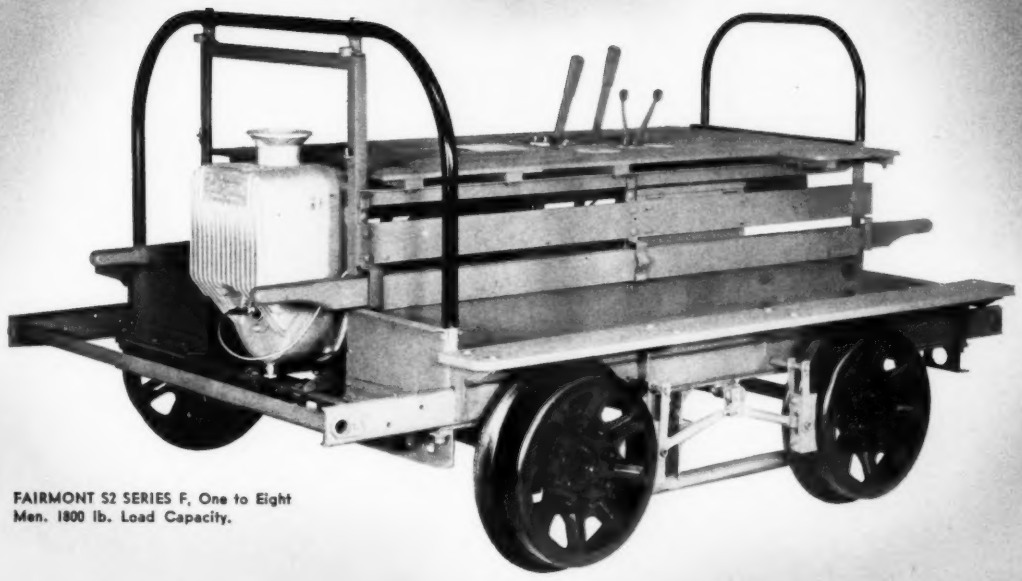


RAILWAY MAINTENANCE CORP.

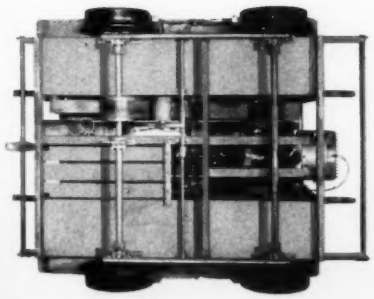
PITTSBURGH, PENNSYLVANIA

Fairmont

SECTION CARS



FAIRMONT S2 SERIES F, One to Eight Men. 1800 lb. Load Capacity.



STRONG, LIGHT WEIGHT CONSTRUCTION gives strength without unnecessary weight.

●

HINGED SEAT TOP permits easy access to the engine, transmission, and other mechanical parts for inspection and servicing in the field, yet leaves all controls in place.

INCLUDE VERSATILE EQUIPMENT

For LOW-COST TRACK MAINTENANCE

No compromise is necessary when you choose equipment for your section crews from the Fairmont line—the world's most complete line of railway motor cars. There are models for six-man crews and for eight-man crews. Some of the cars are sufficiently light in weight to be used in off seasons for one-man inspection service. All are powered by Fairmont roller-bearing or ball-bearing engines. Fairmont time-proved features, such as water cooling, endless cord belt transmission, demountable wheels and easy accessibility of parts, assure low-cost performance and economical maintenance. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

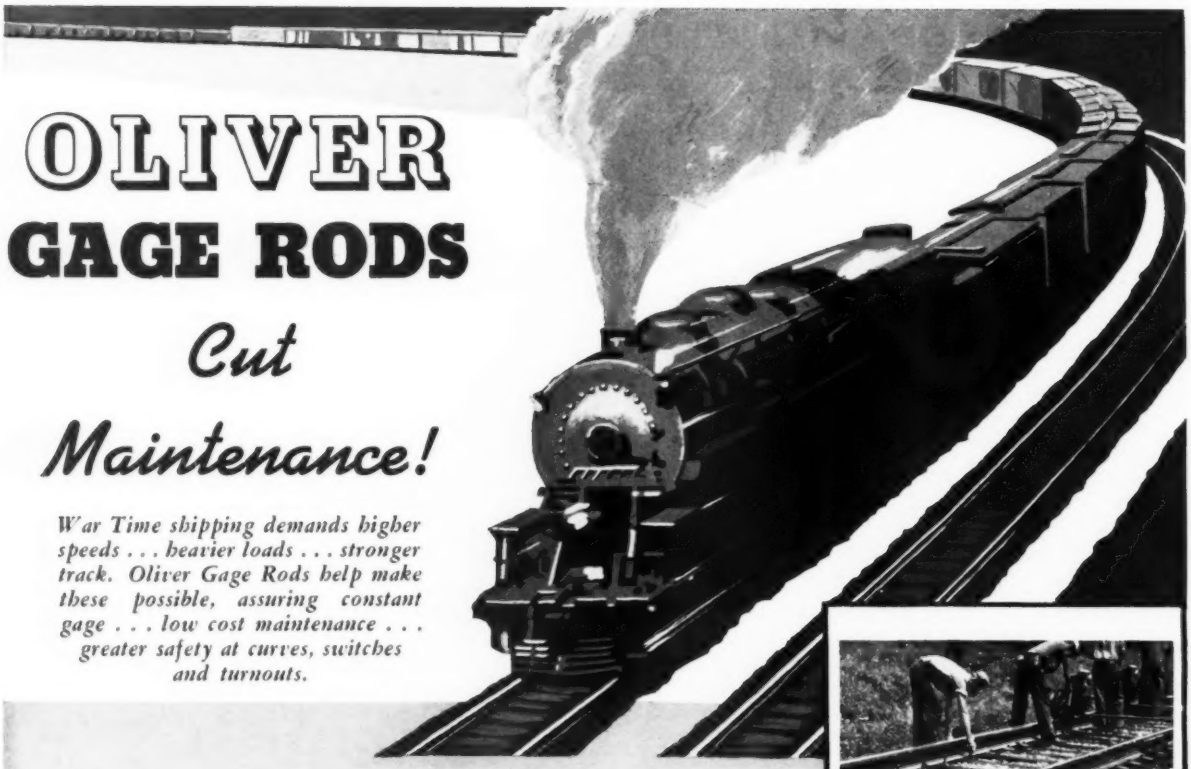
Performance ON THE JOB COUNTS

OF ALL THE CARS IN SERVICE TODAY

More Than Half are Fairmonts

OLIVER
GAGE RODS
Cut
Maintenance!

War Time shipping demands higher speeds . . . heavier loads . . . stronger track. Oliver Gage Rods help make these possible, assuring constant gage . . . low cost maintenance . . . greater safety at curves, switches and turnouts.



Tough, 1-1/4" diameter Oliver Gage Rods anchor both rails together as a single unit, effectively prevent rail movement, reduce costly regaging to an absolute minimum, put an end to "spike-killing" of ties.

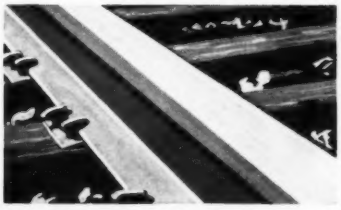
Oliver Iron and Steel Corporation offers a complete line of insulated and non-insulated gage rods for main line, yard and industrial tracks in a wide range of assemblies for every service condition. Investigate the advantages of Oliver Gage Rods for your road. A new descriptive bulletin is now on the press. Write for your copy today.

OLIVER
IRON AND STEEL
Corporation

SOUTH TENTH AND MURIEL STREETS . . . PITTSBURGH, PENNSYLVANIA

Gage Rods . Screw Spikes . Frog and Switch Bolts . Track Bolts
Connecting Rod Bolts . Structural Bolts . Car Builders Specialties

REDUCED MAINTENANCE! Quickly adjustable Oliver Gage Rods end costly regaging. Labor costs alone have been reduced as much as 50%.

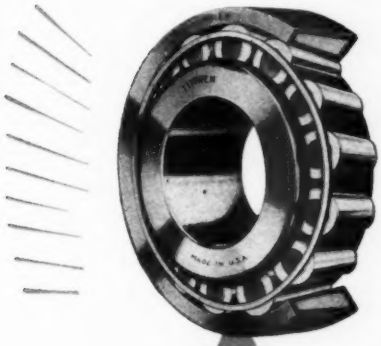


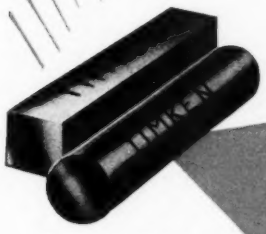
INCREASED TIE LIFE! No more spike-killing of ties through frequent regaging. Greatly reduced spike crushing of ties through reduced lateral thrust.

GREATER SAFETY! Rail thrust by locomotives and cars shared by both rails.

OLIVER INSULATED GAGE ROD No. 62
1-1/4" Hot Rolled open hearth steel, bent rail-hook, malleable iron rail jaws, center insulated, accurate cut threads, heavy hot pressed nut. Fully tested for insulation.

TIMKEN
TAPERED ROLLER BEARINGS





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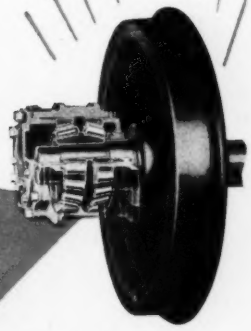
ALLOY STEELS

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

The above trade-mark identifies a group of quality products —each a star in its own right. Make it your buying guide.



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RAILWAY BEARINGS

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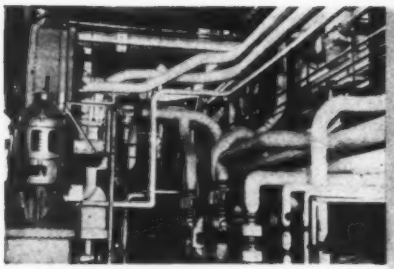
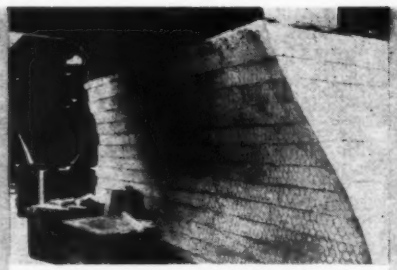
ROCK BITS

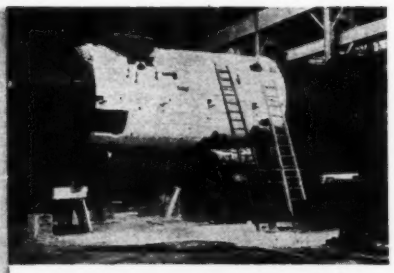
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO



FOR POWER-PLANT PIPING
J-M 85% Magnesia is the most widely used insulation for steam lines up to 600° F. For power-plant and all types of general steam-line piping.



FOR BOILER DRUMS, WATER WALLS, TANKS, BREECHINGS
J-M 85% Magnesia Blocks assure long, efficient service at temperatures to 600° F.



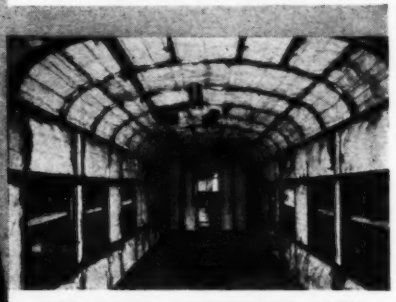
FOR LOCOMOTIVE LAGGING
For years, J-M 85% Magnesia has demonstrated its ability to maintain its high insulating efficiency under the difficult conditions of locomotive service.

For every Railroad Service, there is a

JOHNS-MANVILLE INSULATION

designed to provide highest operating efficiency, long life and maximum fuel savings

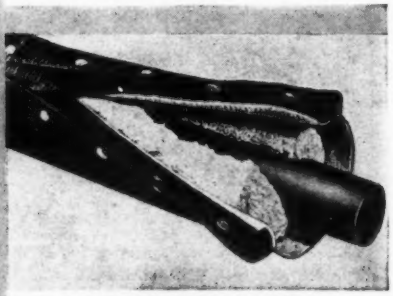
FOR REFRIGERATOR CARS
J-M Hairinsul assures continued economical operation. Easy to apply, durable, light in weight. Virtually impervious to moisture. Odorless, rotproof.



FOR STEEL PASSENGER CARS
J-M Stonefelt is all-mineral and fireproof; combines permanently high insulating efficiency, sound-absorption and light weight.

FOR BUILDING INSULATION
J-M Rock Wool cuts fuel bills . . . keeps buildings more comfortable the year round. Fireproof, rotproof, it assures permanently high insulation savings.

FOR ROOF INSULATION
J-M Rock Cork Roof Insulation meets every requirement of railroad service. Its fire-resistant, rotproof composition assures lasting efficiency.



FOR STEAM TRAIN-LINES
J-M Wovenstone Pipe Insulation is ideal for temperatures up to 450° . . . maintains high efficiency under conditions of moisture and vibration.

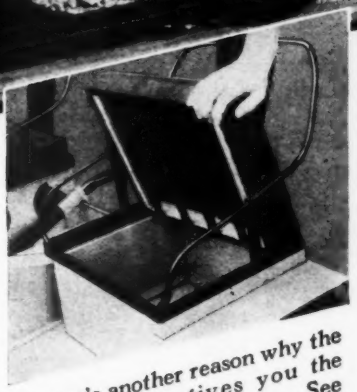
FOR FULL DETAILS, write Johns-Manville at New York, Cleveland, Chicago, St. Louis or San Francisco.

JOHNS-MANVILLE *83 YEARS OF SERVICE TO TRANSPORTATION*

TALK ABOUT EASY RIDING... THIS BUDA *Buddy* BEATS THEM ALL!

As one railroad man to another—you've never had real comfort on a light inspection car until you ride the Buda "Buddy"—the new model F-1 motor car. But don't take my word for it—ride it yourself!

When you do, you'll notice that rail shocks are absorbed by live rubber-cushioned axle bearings. And talk about leg room! You ride *facing forward*, completely relaxed, with all controls right under your hand—you don't even have to stretch to reach them. Believe me, you'll never want to sit "side-saddle" on a hard wooden platform again!



• Here's another reason why the Buda "Buddy" gives you the most comfortable ride . . . See that spring-cushioned seat? This feature alone improves comfort plenty. And notice that big tool compartment under the seat — there's plenty of room for small tools, lunch boxes, etc.

***Also**—if you need a larger, heavier motor car that will carry up to four men, investigate the Buda "Roadmaster". (Model F-2 Roadmaster or small gang car, illustrated above).*

Of course there are lots of other features besides comfort in the Buda "Buddy" — features of safety and economy that make this new 1 or 2-man car absolutely "tops" for inspection and signal work. Write for complete details today.

THE BUDA CO.
HARVEY (Chicago Suburb) ILLINOIS

BUDA
ESTABLISHED
1881

TO RAILWAY SUPPLY MANUFACTURERS

"Helping Win the War"

"Boss, I suppose we'll soon be closing up shop, now that we're in a shooting war."

"Why do you think that, Bill?"

"Well, we can't make guns or ammunition or bombers and that's all the government wants now in its all-out program."

"Yes, it's true that we aren't equipped to make guns or ammunition. But we can do work that's just as important."

"What's that?"

"Just what we've been doing. Making materials the railways need."

"But that's not helping win the war."

"Why do you say that, Bill? Don't you know that the railways are the first aid of our armed forces."

"How do you figure that out?"

"Just this way, Bill. What good is an army if it can't get anywhere or can't get the supplies it needs? Transportation's the very basis of a successful war and the railways are the one dependable agency of transportation."

"You mean then that the railways are going to continue to need our materials?"

"Certainly, they're going to need them more than ever. They've *got* to keep their properties up now. They've *got* to make good the greater wear and tear of war time traffic. They can't afford to take a chance when our nation's security is at stake."

"I see your point, Boss. I hadn't thought of it that way. *We* can help win the war."

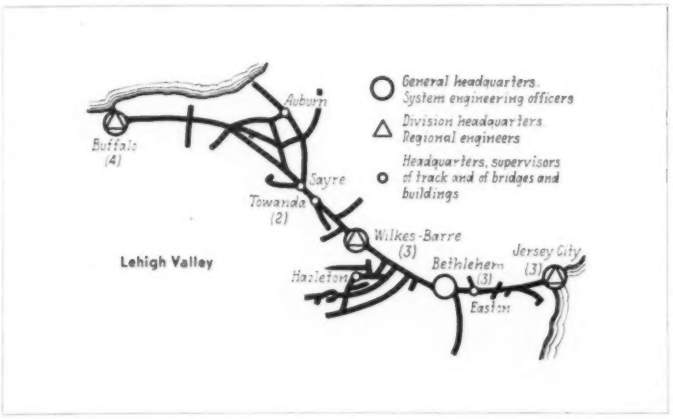
"By doing our work better than ever, Bill."

"That means that I've got to get busier than I've ever been before. And I'll need more advertising in *Railway Engineering and Maintenance* to make my work most effective. It speeds up my calls on the men I see, for they know about our product before I get there and are waiting for me. And that paper reaches a lot of them, too, that I'm never able to see."

"That's right, Bill. It *doubles* your efficiency, especially when you've got a new story to tell, like we have now that we're in the war."

"That's what I mean, Boss."

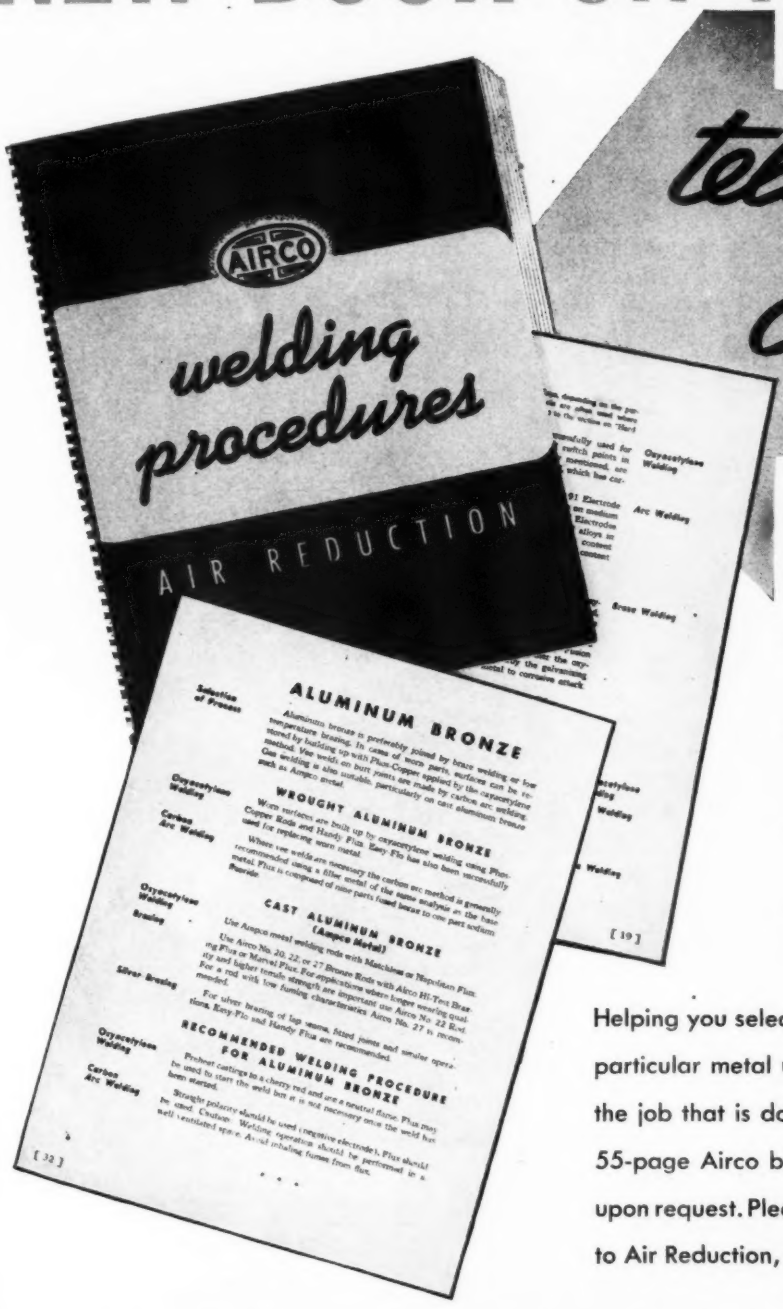
"That's the reason why we're going to increase our space in order to tell our railway friends about our materials and in order to tell them also how to use our materials most efficiently. The larger the space, the more effective our story can be."



Railway Engineering and Maintenance Goes Every Month to the **Chief Engineer,** to the **Bridge Engineer,** to the **3 Regional (Division) Engineers,** to the **8 Supervisors of Track,** to the **3 Supervisors of Bridges and Buildings,** to the **Supervisor of Roadway Equipment,** to the **General Bridge Inspector,** and to **10 Other Subordinate Officers** Who Are in Training for Promotion to Supervisory Positions on the Lehigh Valley.

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

NEW BOOK ON WELDING



tells you clearly

- ★ ***What welding process to use.***
- ★ ***Individual weld characteristics of all commonly used metals.***
- ★ ***Which welding procedure to follow.***
- ★ ***How to estimate cost of welding.***

Helping you select the proper welding process for a particular metal under given circumstances — that's the job that is done with unusual clarity in this new 55-page Airco bulletin. Single copies are available upon request. Please write on your business letterhead to Air Reduction, 60 East 42nd St., New York, N. Y.

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General Offices: 60 EAST 42nd ST., NEW YORK, N. Y.

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SERVING RAILROADS FROM COAST TO COAST

No. 157 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST
CHICAGO, ILL.

Subject: Building a Market

January 1, 1942

Dear Reader:

As you read of the newer developments in maintenance practices in the pages of Railway Engineering and Maintenance from month to month, I often wonder if you ever think of the care with which these articles are selected and prepared. In other words, have you ever considered the "pattern" to which they are built. It is understood, of course, that each article must be interesting. It must also treat of some phase of maintenance of way work. But it must do more than that.

When first established as a section of the Railway Age in May, 1911, and again when it was placed within its own cover in June, 1916, Railway Engineering and Maintenance was dedicated to the promotion of more efficient practices in maintenance of way, and in the years that have since elapsed, this objective has ever been before us. Will it help the railways? Will it stimulate efficiency in their practices? These have been the bases governing the selection of articles.

In these first issues we determined also that the time had arrived when one of the means by which efficiency in maintenance operations could be promoted was by encouraging the development and use of mechanical aids. At that time the motor car was little used and was held in ridicule in many quarters. The tie tamper was unknown – the tie adzer had not yet been thought of. Rail was laid in place with tongs, and ditching was done with steam shovels, flat cars and Lidgerwood unloaders.

In the first issue of the Maintenance of Way Section, we presented a survey of the use of track motor cars, the first of its kind ever to be compiled, showing the results that the pioneers were attaining with this unit of equipment. From this modest beginning, we have kept constantly before you, year after year and issue after issue (368 in all), the possibilities of mechanical aids in maintenance operations. Through these years we have advocated patience in the development of new units until experience in their use had revealed the "bugs" and pointed to their elimination; we have directed the attention of manufacturers to needs as yet unmet; we have emphasized to the men how such equipment lightens their labor.

Witnal, we have, by keeping the possibilities of mechanical equipment constantly before you, issue after issue, created among you an attitude receptive to this equipment that has, in turn, encouraged manufacturers to make the efforts and outlays necessary to develop and improve equipment that merited and won your acceptance.

As a result, within less than a third of a century, we have witnessed the conversion of an industry from methods depending upon brute strength and awkwardness to an industry that is well abreast of other industries in the extent of its use of modern mechanical appliances, and that, as a result, is making possible the maintenance of better track and structures and that has made this work far more attractive for the workmen by freeing them from the drudgery of a generation ago.

This is the transition of a generation - a transition that has contributed greatly to the efficiency with which maintenance work is being done – a transition that has created markets for many manufacturers – a transition that has converted maintenance of way work from unskilled to skilled and made employment much more attractive. It is a transition which reached its greatest heights in 1941 when, as reported in the lead article on a following page, the railways expended more than $10,000,000 for more than 8,000 units of maintenance of way equipment.

This is an achievement in which all concerned – purchaser, builder and user - benefit. It is an achievement in which we as a publication modestly claim a measure of the credit. To us, it reflects the attainment in part of an ideal – the justification of our existence as a service institution. Am I right?

Yours sincerely,

Elmer T. Howson

ETH:EW

Editor

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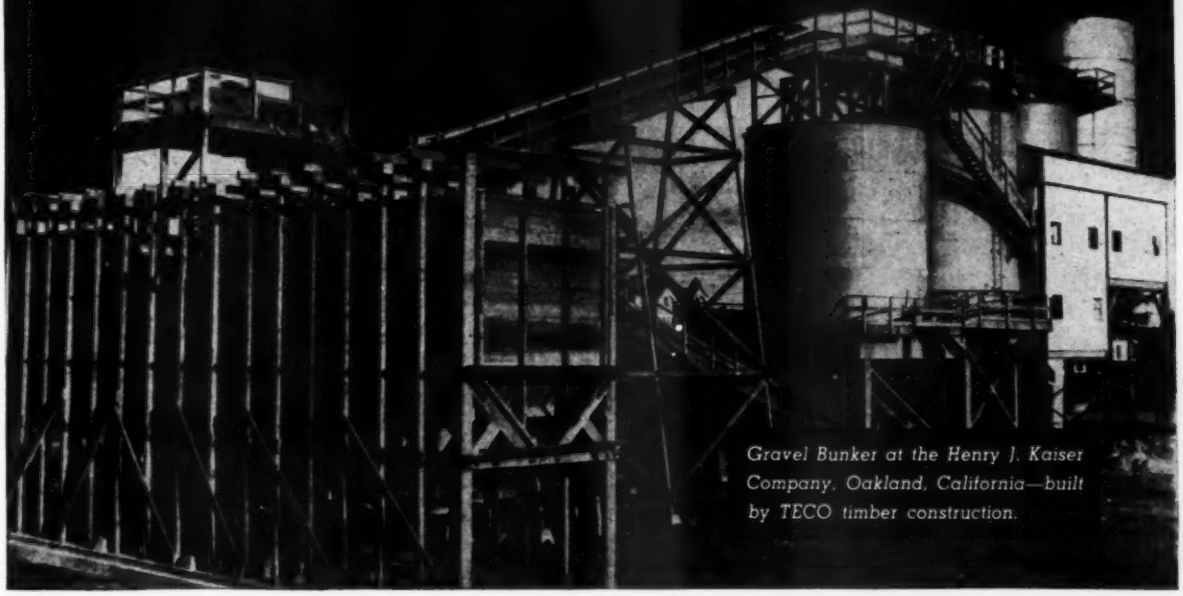
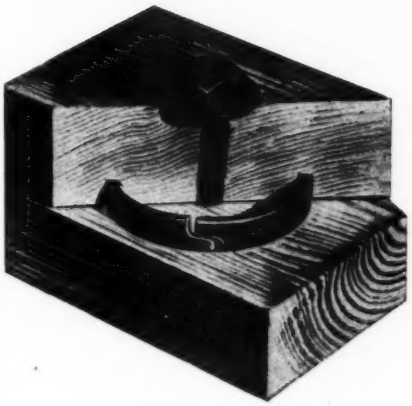
TIMBER Was Chosen For This Tough Task!



Gravel Bunker at the Henry J. Kaiser Company, Oakland, California—built by TECO timber construction.



Where Toughness Counts.. Count on Timber!

Few raw materials, by bulk, are heavier and rougher than gravel.

Gravel bunkers must take constant pounding, grinding and thumping and support a pressure that only the toughest construction could stand.

The TECO System of timber construction builds bunkers that can "take it". TECO Connectors bring the whole toughness of timber into play by strengthening the joints to stand greater stresses.

Send the coupon for detailed information as to how TECO Connectors can help in *your* construction problems!

THE *TECO* RING *CONNECTOR* *spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.*

TIMBER ENGINEERING COMPANY, INC.
1337 Connecticut Avenue
Washington, D. C.

Tear Out . . . . MAIL TODAY!

Timber Engineering Company, Inc., Dept. F-1
1337 Connecticut Avenue, Washington, D. C.

Please send us complete information on the TECO Connector System of timber construction.

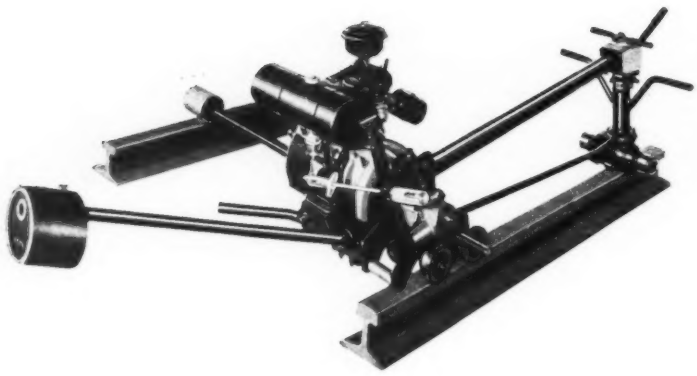
Individual.....

Firm.....

Street.....

City..... State.....

Lightest weight
Most accurate
Most dependable
Fastest



For out-of-face nut tightening **accuracy** and **speed** are essential.

Its micro cut-out sets the Raco Power Track Machine **apart**;—enables it to apply an **exactly equal** power to each nut.

Over the **long stretches,** the Raco proves its speed and economy.

And **most** of the work for a bolting machine is tightening out-of-face.

Raco Power Track Machine

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Railway Engineering and Maintenance

1941

A Year of Record Service

The year 1941 was a period of definite achievement for the railways. Opening with a continuation of the recovery in traffic that began in 1939 and that was stimulated by the initiation of the national defense program in 1940, the railways gradually increased the tempo of their operations throughout 1941 until they reached new high levels of service in the closing months of the year. As a result they enter 1942 with their operations fully geared to the needs of the national emergency.

Never before have the railways of the United States produced so much freight transportation; never before have they handled their traffic with such great efficiency. The year 1941 was one of distinct achievement for the railways; they enter the new year with a determination to attain still higher levels of public service.

Summary of Year's Operations

The high points of the year's operations of the Class I railways of the United States may be summarized from data prepared by Dr. Julius H. Parmelee, director of the Bureau of Railway Economics, as follows:—

Revenue freight traffic (measured in ton miles) reached an all-time high, increasing 25.9 per cent over 1940 and surpassing the previous high record of 1929 by 5.1 per cent. Railway passenger traffic (measured in passenger miles) was the highest since 1929, exceeding that for 1940 by 22.1 per cent and exceeding the low level of 1933 by 78 per cent.

Operating revenues increased 23.9 per cent in 1941 over 1940; they were the largest since 1929. Freight revenues were 25.3 per cent and passenger revenues 22.3 per cent higher than in the previous year.

Total operating costs (operating expenses, taxes and operating rentals) were 20.2 per cent larger in 1941.

Railway taxes reached new high levels in 1941, with a total of $550,000,000. This was an increase of 38.9 per cent over 1940. The previous highest tax total was $397,000,000 in 1929. Taxes took 10.3 per cent of the revenues in 1941, another new high figure, exceeding the previous high ratio of 9.5 per cent in 1938.

Net railway operating income rose to $980,000,000 in 1941, an increase of 43.7 per cent over 1940 and again the largest since 1929.

Purchases of materials, supplies, equipment and fuel by the Class I railroads approximated $1,586,000,000, exceeding similar purchases for the preceding year by $500,000,000. Purchases from manufacturers of materials and supplies, excluding fuel, totaled $1,248,000,000. Total purchases for rail transportation in 1941, including those made by short lines and private car lines, approximated $1,648,000,000.

Capital expenditures approximated $600,000,000 in 1941, as compared with $429,147,000 in 1940. They were the largest made in any year since 1930.

Based on figures of performance during the first 10 months of 1941, the railways again established many new high records of operating efficiency, as shown by the following indices:

The average movement per active freight locomotive (excluding unserviceable and stored units) per day was 116.2 miles, the highest figure ever attained. It compares with 107.2 miles in 1940 and 104.1 miles in 1939.

The average movement per active freight car (excluding unserviceable and surplus cars) was 45.8 miles, another high record. It was 42.6 miles in 1940.

The average load per freight train was 915 net tons, exceeding the previous high record of 849 tons in 1940.

The average load per freight car was 28.4 tons or 0.8 ton more than in 1940, the previous record.

The gross ton miles per freight train hour exceeded all previous records for the ninth consecutive year. The 1941 figure of 34,814 gross ton miles was 3 per cent above that for 1940 and more than twice that for 1922.

In equipment maintenance, the railways reached all-time lows on December 1, 1941, in the number of locomotives (9.2 per cent) and in the number of freight cars (4.1 per cent) unserviceable. These figures compared with 15.9 per cent and 9.6 per cent, respectively, as recently as January 1, 1940.

In addition to raising the efficiency of their service to new high levels, the railways extended their ultra-modern services into new areas during the year. In passenger service, they added 36 new streamlined trains during the year, bringing the number of these trains to 125. In addition, 22 more trains were on order as the year ended, for delivery during the spring. The trains added during 1941 serve widely separated areas and brought the latest in equipment and schedules to many areas not heretofore served in this manner.

Freight service during the year was characterized more largely by the maintenance of existing fast schedules than by the addition of new fast trains or the further shortening of running time. Rather, the tendency was to bring more and more of the slower trains up to the schedules of the faster "flagships." These steadily increasing speeds added to the pressure on maintenance forces to bring their tracks and structures up to standards commensurate with the demands of this traffic and to maintain them at this level.

Construction—Abandonments

Reflecting the increased tempo of the railway industry, construction activities increased markedly during the year. Especially was this true of projects involving the reconstruction and modernization of existing facilities to adapt them to the changing needs of transportation and to enable the railways to cope with the rapidly rising surge of traffic. Indicative of such work are the classification yard now being built by the Norfolk and Western at Roanoke, Va.; the new 18-mile line change undertaken by the Rock Island late last year to improve curve and grade conditions north of Princeton, Mo., and the tunnel

that the Chesapeake & Ohio is driving through the crest of the Allegheny mountains in West Virginia.

As in recent years, much work was also done to eliminate grade crossings between high speed railways and heavily traveled highways, jointly with the federal and state highway departments, and to protect other crossings with modern signal warning devices. Of a similar nature, a number of railways undertook or continued projects of grade separation through cities during the year. Coincident with the receipt of larger locomotives, several railways, especially the Southern Pacific and the Union Pacific, lengthened passing sidings, extended engine houses and installed longer turntables at numerous points. Other roads continued to revise and lighten the curvature on high speed lines to eliminate or reduce speed restrictions.

In new line construction, the railways of the United States completed more than twice as many miles of new lines in 1941 as in 1940;—yet the total last year was still pitifully small—54 miles as compared with 26 miles in 1940. This compares with an average of 2,884 miles built annually during the 20 years ending with 1921 and with 13,081 miles built in 1887, the year of most active construction. Of the 1941 mileage, 28 miles consisted of a relocation of a branch line of the Great Northern, made necessary by the construction of the Grand Coulee dam in Washington; the remainder was in small sections in 7 different states. A total of 8.29 miles of second track, 2.22 miles of third track and 1.54 miles of fourth track was built, as compared with 25.92 miles of second track built in 1940. One mile of new first main track was built in Canada in 1941.

A new class of new track construction that appeared first in 1940 loomed large again in 1941. This was the construction of tracks to serve munition plants, training camps and military and ordnance depots. To date, this form of construction has approximated 1,250 miles of tracks with some 1,350 miles more in contemplation, as much as 112 miles being built at a single plant.

In abandonments, the year recorded 1,509 miles of lines removed from service. This was 210 miles more than in 1940 and has been exceeded in only 6 of the 25 years in which such records have been compiled. It was the tenth consecutive year in which this total has exceeded 1,000 miles. Fourteen entire railways were abandoned in 1941, while the largest single abandonment was that of the Denver & Rio Grande Western between Antonito, Colo., and Santa Fe, N. M., 125.79 miles. During the period beginning with 1917, a total of 26,700 miles of lines have been abandoned, while in this same period only 10,610 miles of new lines have been built, leaving a net decrease of 16,090 miles of road.

Larger Allotments for Maintenance

Of particular interest and significance to maintenance men has been the steadily increasing liberality in maintenance allotments during the year. This was in part a reflection of the recognition that more work was necessary to make good the greater wear and tear of the heavier and faster-moving traffic. It was also in part the expression of a realization that the railways must get their properties in condition to handle the still heavier and more exacting traffic of 1942 with a dependability commensurate with war-time needs. And it reflected also the long proven custom of making expenditures when the earnings permitted.

Especially illuminating was the steadily increasing rate of expenditure as the year progressed, as shown in the accompanying month-by-month comparison with 1940.

As a result of this trend, the expenditures for maintenance of way and structures for the year as a whole exceeded those for any year since 1930, and in the closing months of the year they even exceeded those for the same months of 1930.

Maintenance of Way and Structures Expenses

	1940	1941	Increase
January	$33,933,480	$36,737,443	8.3 per cent
February	33,204,843	36,145,377	8.9 per cent
March	36,379,734	41,168,148	13.2 per cent
April	39,644,624	45,461,554	14.7 per cent
May	44,175,476	51,640,349	16.9 per cent
June	45,305,125	52,532,563	15.9 per cent
July	46,935,400	54,709,486	16.6 per cent
August	48,495,425	56,209,812	16.0 per cent
September	45,725,943	56,022,630	22.5 per cent
October	47,205,781	62,628,498	32.6 per cent

Maintenance Expenditures 1917-1939

1917	$ 442,108,862	1930	$ 705,470,940
1918	649,794,953	1931	530,612,890
1919	772,186,045	1932	351,179,041
1920	1,032,540,381	1933	322,335,022
1921	756,413,690	1934	365,285,353
1922	728,663,534	1935	393,642,261
1923	813,688,760	1936	454,842,407
1924	792,678,023	1937	495,593,913
1925	816,443,205	1938	420,147,125
1926	866,819,365	1939	466,830,844
1927	868,581,432	1940	497,031,272
1928	837,905,747	1941*	590,000,000
1929	855,354,867		

*Last two months estimated.

Major Considerations of the Year

In keeping with the traditions of the maintenance department, major emphasis in 1941, as heretofore, was placed on the tracks and on those other facilities that bear a direct relation to safety. In this respect maintenance forces maintained the record that has won the admiration of their managements and of the public during the difficult years through which we have been passing. And in 1941 they were called on to restore to service many tracks and other structures that had been idle and neglected since the early days of the depression, and that, as a result, required heavy replacement of materials.

Even beyond this, however, many railways were able to give attention to buildings and other structures that were in daily service but that had long been neglected, with the result that more buildings were painted, more roofs were renewed, more foundations strengthened and more other work of a similar character done than for a decade. As a whole, the railways made definite progress in reducing the deferred maintenance that accumulated during the decade of the depression, although little more than a good start has yet been made.

Closely akin to the deferred maintenance that has accumulated is the volume of improvement and modernization work that is demanded today to bring the fixed properties in step with changed conditions of operation. The growing practice of "fleeting" freight trains is making inadequate the storage facilities at many water stations. The emphasis on faster schedules is making necessary facilities for delivering water, coal and sand to freight locomotives at one spotting while also dumping fires. Similarly, these faster schedules are necessitating longer turnouts and crossovers capable of higher speeds. And in buildings, the demands are equally pressing, especially in passenger stations where the facilities at most points provide such a sorry contrast with the trains stopping at these stations. A small beginning was made in the cor-

rection of these conditions by a few roads at a few points in 1941; the years immediately ahead will require the almost complete reconstruction of many of these facilities to keep pace with the demands of service.

Rails and Ties

Turning from comparisons of dollar expenditures for all maintenance purposes to more specific indices of the adequacy of the renewals made in 1941, the railways laid approximately 1,200,000 tons of rails in replacements—a tonnage 20 per cent larger than in 1940 and larger than in any year since 1930. Yet, encouraging as this 1941 total is, it is still only slightly more than half the tonnage laid annually in the years 1925-29. In part, the increase reflects the heavy demands during the year for rail for tracks serving munition plants and training camps which the railways could provide only as it was released by the laying of new rail.

As a whole, the rail laid was no more than sufficient to make good the wear and tear of the year's traffic. As a result the railways as a whole enter the new year with an accumulated deficiency in the renewal of rails approximating that of a year ago, which we estimated at that time to total some 3,000,000 tons. It is significant that the railways have asked for 1,500,000 tons of rails for 1942 as the minimum essential to the adequate maintenance of their properties. On this basis the railways are two full years behind in their rail renewals.

Rail Applied in Renewals—Class I Roads

	Gross Tons		Gross Tons
1925	1,950,146	1934	631,093
1926	2,209,873	1935	582,794
1927	2,124,765	1936	921,298
1928	2,080,277	1937	1,029,861
1929	1,958,489	1938	599,752
1930	1,517,002	1939	878,643
1931	984,900	1940	998,914
1932	394,536	1941	1,200,000*
1933	403,254		

*Estimated

In tie renewals, the railways did not fare so well in 1941, for while the 45,500,000 ties that were installed exceeded the total for the preceding year by a slight margin, they approximated the same as were renewed in 1939 and were actually less than were renewed in 1936 and 1937. The relatively low total for 1941 continued to reflect the salvaging of ties from tracks abandoned, but

Crossties Applied in Renewals—Class I Roads

1925	82,716,674	1934	43,306,205
1926	80,745,509	1935	44,351,900
1927	78,340,182	1936	47,361,015
1928	77,370,491	1937	47,729,538
1929	74,679,375	1938	41,363,224
1930	63,353,828	1939	45,088,278
1931	51,501,659	1940	43,620,653
1932	39,190,473	1941	45,500,000*
1933	37,295,716		

*Estimated

even after giving recognition to this slight influence, it is evident that the railways made no appreciable progress in reducing the accumulated deficiency in renewals necessary to restore their tracks to the condition existing in 1929, which deficiency we estimated last year to total at least 90,000,000 ties, or, likewise, two full years of renewals, at the 1941 rate. With the heavier traffic anticipated in 1942, and the restoration to service of tracks long idle and neglected, it is to be expected that the tie requirements will increase considerably, creating a problem for the tie producers which they may not be able to solve easily, with so many of their woodsmen attracted to defense plants by the high wages offered there.

Especially outstanding during the last year was the greatly increased utilization of work equipment. In this year a total of 8,007 units were acquired, involving an outlay of some $10,500,000. These totals compare with 5,414 units, costing $7,250,000, purchased in 1940. This increase of 48 per cent in units purchased in 1941 followed a 50 per cent increase in units acquired in 1939. In other words, more than twice as many units of work equipment were purchased last year as were secured two years ago, and that year in turn recorded the largest purchases up to that time. Furthermore, the purchases made last year included 152 different types of equipment, as compared with only 100 types as recently as 1937 and 125 types in 1939.

This rapid, almost meteoric, increase in the purchase of work equipment reflects several influences. In the first place, it denotes further and more universal acceptance of the economy, if not the indispensability, of such aids in maintenance operations, an acceptance that has been stimulated by the increase in wage rates put into effect on many roads in 1940 and the further increase that came out of the wage conferences in the closing weeks of 1941.

Also, many of the purchases made last year were for the replacement of older units, reflecting a growing recognition on the part of the railways of the economy of retiring old units that have been outmoded and made obsolete by newer and more efficient designs. While the railways have been backward in recognizing obsolescence in work equipment when their needs for the complete mechanization of their forces were as yet unmet, as this condition is corrected, they are beginning to give recognition to the further economies offered by the progressiveness of equipment builders and it is to be expected that further recognition of obsolescence will be reflected in still larger turnovers in equipment in the years ahead.

What of 1942?

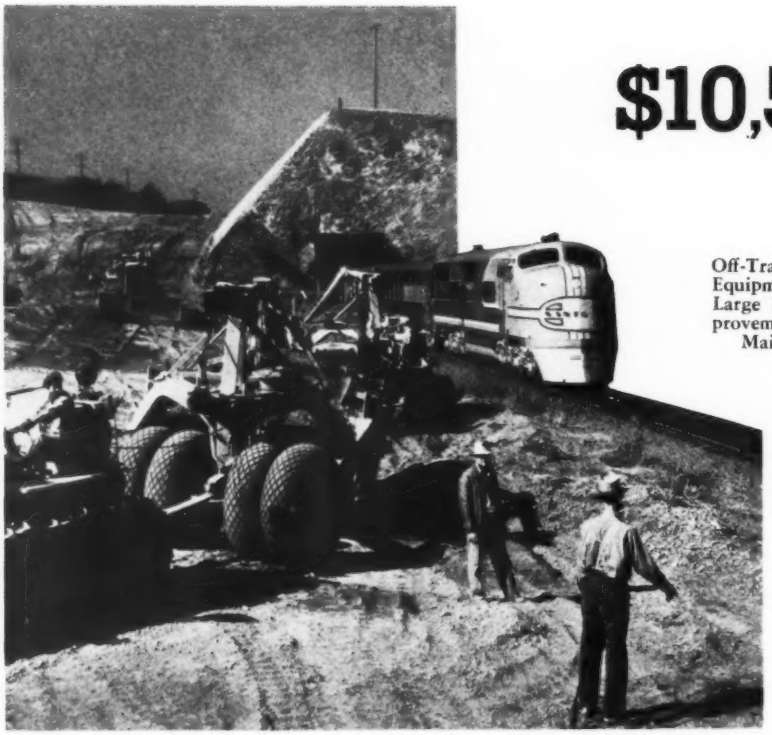
Maintenance officers enter the new year with concern. As an agency in our National defense, our railways are second in importance only to our armed forces. They must be prepared to meet all demands. In this, maintenance forces bear a heavy responsibility, for no railway service is more dependable than its tracks and structures. These forces face the necessity for maintaining their facilities in condition to meet the added demands that will be made on them by the heavier traffic that is to be expected in 1942.

It is to be expected also that our entrance into a "shooting" war will be reflected in the loss of maintenance men, especially in the younger groups, to our armed forces and also to other war-time industries. This, coupled with added difficulties in securing materials, will call for added resourcefulness on the part of all, to insure that the best possible service is secured from the men and materials that are available.

The year will undoubtedly be one of continued uncertainty. Each day will bring its new difficulties and its new problems. These must be solved in the light of the conditions existing at the moment. They will call for a resourcefulness and a devotion to duty comparable to that of the men at the front.

Maintenance men are accustomed to facing emergencies. They have long taken blizzards, floods and wrecks in their stride. They will meet the new conditions in the same spirit and with the same determination to serve their country in this even more critical emergency.

$10,500,000 for



Off-Track Earth-Moving Equipment Is Finding A Large Place in Line Improvement and Routine Maintenance Work

A NEW record for purchases of work equipment was made by the railways in 1941, through the buying of 8,007 units of mechanized equipment of 152 different types, at a cost of approximately $10,500,000. Not only is this the largest number of units of work equipment ever purchased in a single year, but it represents an increase of 48 per cent over the 5,414 units purchased in 1940. Still more impressive, these purchases follow six years of intensive buying of work equipment, which, with one exception, have grown progressively larger year by year.

Furthermore, although most roads have not yet completed their budgets for 1942, enough of them have done so to indicate definitely that the roads as a whole will set a still higher record in 1942. In fact, some roads have already placed orders for the equipment that they will require in 1942, delivery of which they fear may be delayed by war priorities.

Both the magnitude of the purchases made in 1941 and their diversity demonstrates the progress that has been made in the mechanization of maintenance forces since it started practically from scratch less than a quarter-century ago. The fact that these purchases have increased steadily year by year for the last decade is also an indication of the extent to which mechanization is taking place currently. It is of particular interest that the large increase that occurred in 1941 followed a similar comparative increase in 1940, the purchases for that year having been 50 per cent greater than 1939.

Diversity of Types

One of the interesting and important facts disclosed by the purchases made in 1941 is the wide diversity of types of power machines and power tools employed by the railways, 152 different types having been listed by the roads giving information regarding their purchases. This compares with 118 types in 1940 and 125 in 1939. It is also in strong contrast with the few types that were available no longer than 20 years ago. In considering this amazing expansion in the use of work equipment and the many types that are now available to maintenance officers, one should not overlook the severe setback that purchases of all work equipment received immediately following the catastrophe of 1929.

When one views the expanding use of work equipment and the new uses that are constantly being found for it, and then considers the many as yet unfilled needs, the only conclusion to be drawn is that despite the expanding purchases of recent years, the ultimate possibilities with respect to the use of this equipment have not as yet even been approached. In other words, despite the large amount of work equipment that is already in use, this is no criterion of its ultimate possibilities, for maintenance officers are realizing more and more the advantages of mechanizing their operations, and are taking more advantage of all opportunities that are offered for them to do so.

Shortage in All Types

As yet no road has all of the work equipment it needs, and only a negligible few have enough of any particular types, with the possible exception of the motor car. This is confirmed by both observation and direct statements of many maintenance officers. In fact, not a few officers who, only a short time ago, believed that they had all of the work equipment that it was possible for their forces to use effectively, are now among the strong advocates of a wider use of this equipment, and are buying as much as their appropriations will permit.

Any study of work equipment will disclose that manufacturers are striving constantly to improve their machines, with the result that many of them have been redesigned in recent years and important improvements have been made in others. It is well known that, because of the intensive use to which power machines and power tools are subjected in railway service, the mortality rate of this equipment is high. Yet, despite this relatively short life, the rapidity with which improvements in operating and other characteristics have occurred, has made obsolescence a factor of almost as great importance potentially as wear in the replacement of existing units of work equipment.

While it is obvious that many of the units that were purchased in 1941 were for the replacement of worn-out and obsolete machines (for as long as power machines and power tools continue to be used there will be a large and stabilized demand for the replacement of such units as they

Work Equipment in 1941— Up 48%

New High Peak Established by the Purchase of 8,007 Units of 152 Different Types During the Year. Budgets for 1942 Provide for Still More Power Machines and Tools

become worn and out-moded, and for repair parts) it is equally obvious that many others were obtained primarily as additions to the equipment already owned. This is confirmed by the number of units purchased by individual roads, as well as by the fact that there were large-scale purchases of types that have become available only recently and of others that have only recently been applied in maintenance work.

To obtain the information that is given in detail on the following pages, inquiry was made of all of the roads in the United States, Canada and Mexico, as to their purchases of work equipment. Replies were received from 474 roads, representing 84 per cent of all of the railways in these three countries, including all but three of the Class I roads in the United States. Of this number, 160 reported purchases of work equipment during the year and listed their purchases. This compares with 119 roads that made similar purchases in 1937, with 81 in 1938, with 124 in 1939 and with 152 in 1940.

Modern Designs Wanted

One of the conclusions to be drawn from these replies is that a constant effort is being made by maintenance officers to keep their equipment modern. Probably the most outstanding of these indications is found in the number and character of the motor cars purchased during the year; a study of this list will also give some indication of the present trends in maintenance practices. During 1941, a total of 2,483 motor cars were purchased. This includes a considerable number of heavy-duty cars, pointing to an increase in the number of large gangs, as might have been expected from the increased appropriations for track maintenance. Again, the relatively large purchases of inspection cars during the year point to a continuation and probable expansion of the trend that has been so noticeable in recent years of taking track inspection out of the hands of the section foremen and assigning men to cover several sections, whose principal duties are those of the old-time track walker. However, the majority of the cars purchased last year were of the lighter designs for section use, indicating a continuation of the smaller section gangs that mark the maintenance organization today.

Motor cars also provide another illustration that cannot be ignored. Some manufacturers have felt that the point of saturation for work equipment is so close that they can foresee no future market for their products. This group was particularly fearful after the calamity of 1929 left practically every road with a temporary surplus of work equipment on its hands. Motor cars have been used longer than almost any other type of work equipment in service today, and since their use is practically universal, they should demonstrate the truth or falsity of this theory of saturation.

It is of interest, therefore, that despite the surplus of motor cars that persisted until 1935 as a result of the force reductions and consolidation of gangs that were made during the depth of the depression, and despite the fact that purchases of motor cars have been relatively large in every year since 1935, except 1938, the number purchased in 1941, totaling 2,483 units of all types, represents the largest number ever purchased in a single year. This indicates quite clearly that if the point of saturation for this equipment has been reached, it has not resulted in destruction of the market for motor cars.

A similar example is provided by tie tampers. This equipment, first de-

The Purchases of Motor Cars and Trailers in 1941 Greatly Exceeded Those in 1940, More Than 2,480 Motor Cars of All Types Having Been Purchased Last Year

veloped as a practical mechanical aid for track maintenance less than 30 years ago, has had as wide, if not wider, use than any other type except the motor car. The value of tamping equipment has been demonstrated so clearly that the railways have bought liberally for a number of years. Yet the 1941 purchases, amounting to 226 tie-tamping outfits, ranging from 4 to 16 tools each, and 891 individual tampers, in addition to 105 tie-tamping tools, give no indication that the point of saturation is at hand or even that it is being approached. On the contrary, they point definitely to a rapidly expanding use of this equipment.

In addition to the power plants that were included with these outfits, and with the welding equipment and paint spraying outfits that were purchased, the railways bought 118 air compressors and 93 generators. While some of these power plants were purchased to replace worn-out or obsolete units, particularly single-stage compressors, of which a considerable number still remain in service, the majority were for the purpose of operating small and portable power tools. As evidence that this is so, a total of 593 of these latter units were purchased during the year. This is an understatement of the number of small tools, for a number of roads reported purchases of generators or air compressors and "a set of portable bridge tools."

Last year, for the first time since 1929, the railways evinced considerable interest in earth-moving equipment, except that adapted for ditching. That this interest was continued in 1941 is shown by the purchase of 112 units of this equipment, 20 more than in 1940, including 21 power shovels, 9 combination cranes and draglines, 47 draglines, 3 carryalls, 31 bulldozers and angle dozers and 1 spreader-ditcher. As a sign of the times, it is interesting to note that none of this equipment, except the spreader-ditcher, has railway mountings.

One of the major tasks confronting the maintenance forces in 1941 was the laying of 1,200,000 tons of rail. In preparation for this task, 473 units of rail-laying equipment were purchased, including adzing machines, bolt tighteners, spike pullers, rail cranes, spike drivers and rail and bonding drills. While some of this equipment was intended for the replacement of worn-out units and particularly of obsolete rail cranes, the greater part was additional.

For the last two or three years, the railways have been cutting and generally clearing the right of way of the vegetation that had been allowed to grow with little molestation during the depth of the depression. In 1940 a total of 116 units of weed-destroying equipment were purchased to accelerate this work. In continuation of this effort to improve the appearance of the right-of-way and station grounds and to insure cleaner ballast, the railways purchased 278 units in 1941, or more than twice as many as in the previous year. Included in this list were track mowers, off-track mowing machines, tractor-mowers, power scythes, discers, scarifiers, weed burners and chemical sprayers.

Highway Vehicles Gain

Although motor-driven highway vehicles have been available to the maintenance forces as long as they have to the general public, they were slow to adopt them or to see any advantage in their use. Beginning about five or six years ago, however, the advantages of this form of transportation for both men and materials began to be appreciated, as local train service was so curtailed that men could not get to jobs easily or be shifted freely. As a result, purchases of motor trucks have been increasing steadily, and in 1941 reached a total of 353 units, and in addition 19 highway trailers and 52 passenger automobiles were bought. As with many other types of equipment, these figures represent the largest purchases of motor trucks ever made in a single year, and are almost double 1940, when 181 trucks were purchased.

There was a continuation of interest in welding, as is shown by the purchase of 38 welding units, mostly for the building up of rail ends and for the repair of frogs and crossings of manganese steel, although several units of this equipment were purchased for the structural forces. There was no indication in the reports received this year that any of the generating units were tractor mounted.

A review of the number of units of work equipment purchased since 1937, the first year for which these data were recorded, should be of interest to maintenance officers. The number for 1937 and succeeding years is as follows: 1937, 3,310 units; 1938, 1,376 units; 1939, 3,547 units; 1940, 5,414 units; 1941, 8,007 units. While there can be no debate that increased income during 1940 and 1941 was the principal factor leading to the larger purchases in those years, a further study of the purchases of individual roads, however, particularly those in the southeastern states, indicates that the increasing wages of track labor has also been an important factor in stimulating the purchase of work equipment by some of the roads in this area.

A detailed list of all work equipment purchased in 1941 by all of the railways in the United States, except the three Class I roads mentioned, and by most of the railways in Canada, and one in Mexico, follows:

Nearly 150 Cranes, Draglines and Shovels — Straight and Convertible — Were Among the Equipment Purchased in 1941

United States

The Akron & Barberton Belt

1 Motor car, section
1 Trailer, motor car

Akron, Canton & Youngstown

1 Grinder, rail
1 Motor car, section
1 Motor car, inspection
1 Motor truck
1 Power jack

Alaska

1 Generator, portable
3 Motor cars, heavy duty
3 Motor trucks
3 Tractors

Alton

1 Air compressor
1 Bolt tightener
3 Motor cars, section

4 Motor cars, inspection
10 Motor car frames

Apache
2 Motor cars, section

Apalachicola Northern
1 Motor car, section

Atchison, Topeka & Santa Fe System
14 Air compressors
1 Concrete mixer
3 Cranes, rail
1 Dragline-shovel, combination
4 Drills, rail
1 Generator with drills and saws
1 Grinder, rail
87 Motor cars
2 Mowing machines
1 Pump, centrifugal
1 Sand blasting machine
1 Saw, electric
1 Spike puller
1 Tractor, bull-dozer
4 Wrenches, power

Atlanta & Saint Andrews Bay
1 Motor car, inspection
4 Motor car engines
1 Tie tamping outfit

Atlanta & West Point-Western Railway of Alabama
1 Dragline
5 Motor cars, section
1 Motor car, heavy duty
3 Motor cars, inspection
1 Power mower
1 Tie tamping outfit

Atlanta, Birmingham & Coast
6 Motor cars, section
1 Motor car, inspection
8 Trailers, motor car

Atlantic & Western
1 Motor car, section
1 Push car

Baltimore & Ohio
1 Grinder, rail, small
16 Motor cars, inspection
9 Motor cars, section
2 Motor cars, heavy duty
1 Motor truck

Bangor & Aroostook
1 Boiler, portable, steam
1 Bolt tightener, power wrench
1 Grinder, rail
1 Motor car, section
3 Motor cars, inspection
1 Motor truck

Bath & Hammondsport
I Mowing machine, track mounted

Belfast & Moosehead Lake
1 Discer
1 Motor car engine
2 Push cars

Belt Railway of Chicago
1 Concrete mixer
2 Drills, rail
1 Grinder, rail, hand
1 Jackhamer
4 Rail and flange lubricators
1 Welding outfit
1 Wood borer

Bessemer & Lake Erie
1 Bucket, clam shell
1 Concrete vibrator
2 Drills, bonding
2 Drills, heavy duty
2 Generators, portable
1 Grinder, rail, small
1 Hammer
2 Motor cars, inspection
5 Motor cars, section
1 Motor truck
2 Pumps, centrifugal
2 Saws, circular
7 Tie tampers
3 Trailers, motor car

Bingham & Garfield
1 Drill, rail
1 Motor car, heavy duty

Birmingham & Southeastern
1 Motor cars, section

Boston & Maine
1 Air compressor
2 Bolt tighteners
2 Drills, rail
1 Drill, pneumatic
1 Drill, close quarter
3 Grinders, hand
1 Grinder, valve
2 Hammers, riveting
20 Motor cars, heavy duty
50 Motor cars, inspection
38 Motor cars, section
5 Motor trucks
2 Outboard motors
1 Rail and flange lubricator
1 Rivet cutter
2 Saws, rail
20 Tie tampers
2 Tie tamping outfits
2 Tractors
1 Welding outfit
1 Wrench, impact

Boyne City
1 Conveyor, portable
1 Motor car, section

Buffalo Creek
1 Bolt tightener
1 Grinder, rail, hand
2 Rail and flange lubricators
2 Trailers, motor car
1 Weed burner

Buffalo, Union-Carolina
1 Grinder, hand

Cambria & Indiana
1 Bolt tightener
1 Drill, rail
1 Grinder, rail, small
2 Motor cars, section
2 Push cars
1 Saw, rail

Carolina & Northwestern
1 Jackhamer
1 Motor car, heavy duty
5 Motor cars, section
1 Power shovel

Central of Georgia
1 Bolt tightener
3 Grinders, rail, small
7 Motor cars, inspection
2 Motor cars, heavy duty
2 Mowing machines
4 Rail and flange lubricators
8 Tie tamping outfits

Central of New Jersey
3 Bolt tighteners
1 Drill, electric
2 Drills, rail
1 Grinder, emery
7 Motor cars
3 Motor trucks
14 Push Cars
2 Pumps, centrifugal
2 Saws
60 Tie tampers

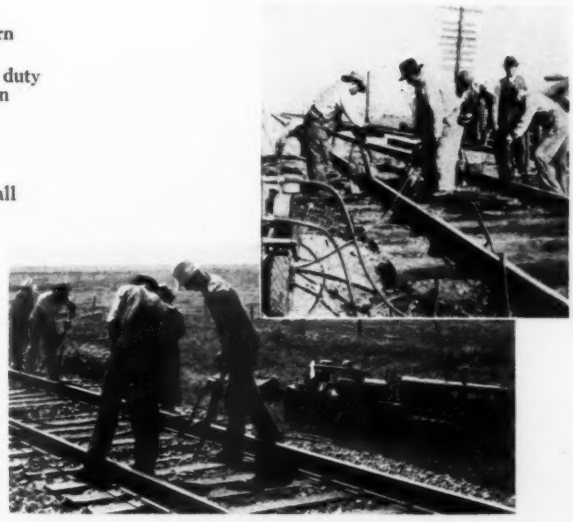
Charleston & Western Carolina
1 Motor car, inspection
24 Rail and flange lubricators

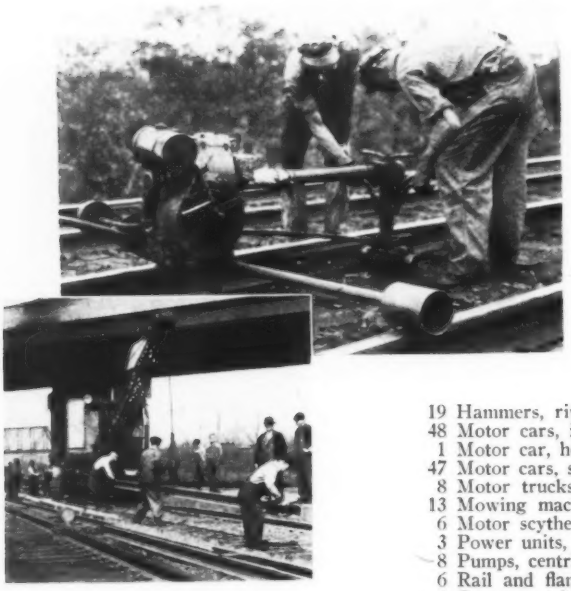
Chattahoochee Valley
1 Motor car, heavy duty

Chesapeake & Ohio
6 Air Compressors
4 Automobiles
3 Bolt tighteners
2 Buckets, ore
2 Buckets, bottom dumping
2 Buckets, front-end loading
2 Bulldozer blades
4 Concrete mixers
2 Drills, bonding
4 Drills, rock
5 Drills, rail
5 Grinders, rail, small
1 Grinder, switch
1 Hammer, pile
40 Motor cars, inspection
64 Motor cars, section
10 Motor cars, heavy duty
5 Motor trucks
2 Mowing machines
2 Paving breakers
1 Power shovel, combination dragline
3 Pumps, centrifugal
16 Rail and flange lubricators
3 Tie tamping outfits
5 Tie tamping tools
2 Tractors
17 Wood borers
2 Wrenches, impact

Chicago & Eastern Illinois
1 Drill, rock
1 Grinder, rail slotter
1 Mowing machine

The Purchases of Various Types of Tie Tamping Equipment Last Year Broke All Previous Records





More Than 470 Units of Rail-Laying Equipment Were Purchased in 1941

1 Paint spraying outfit
100 Portable switch heaters
1 Portable scale for concrete mixer
2 Pumps, centrifugal
8 Rail pullers and expanders
1 Sewer cleaner
2 Tie tamping outfits
6 Track tools, one man

Chicago & Illinois Midland

1 Automobile
3 Motor cars, inspection
2 Motor trucks
1 Mowing machine

Chicago & North Western

1 Air compressor
2 Concrete mixers
1 Drill, bonding
1 Grinder, rail, hand
22 Motor cars, inspection
3 Motor cars, heavy duty
3 Motor trucks
8 Mowing machines
2 Pumps, centrifugal
11 Rail and flange lubricators
1 Saw, rail
1 Saw, circular
4 Tie tampers
1 Tie tamping outfit
1 Tractor

Chicago & Western Indiana

1 Air compressor
1 Drill, rail
3 Generators, portable
1 Motor car, section
1 Motor truck, dump body
1 Portable electric sander
4 Rail and flange lubricators
1 Spike driver, air
4 Tie tamping tools

Chicago, Burlington & Quincy

1 Adzing machine
3 Automobiles
4 Bolt tighteners
8 Concrete mixers
1 Creosote sprayer
1 Dragline
12 Drills, steel
1 Drill, rock
1 Generator
1 Grinder, surface
6 Grinders
1 Hammer, pile
19 Hammers, riveting
48 Motor cars, inspection
1 Motor car, heavy duty
47 Motor cars, section
8 Motor trucks
13 Mowing machines
6 Motor scythes
3 Power units, gas driven
8 Pumps, centrifugal
6 Rail and flange lubricators
4 Saws, portable
3 Spades, pneumatic
2 Snow plows
22 Tie pullers
5 Tie tamping outfits
4 Tie tamping tools
2 Tractors
4 Wood borers
1 Wrench, impact

Chicago, Indianapolis & Louisville

2 Bulldozers
1 Front-end loader
1 Grinder, small
6 Motor cars, inspection
9 Motor cars, section
1 Pump, centrifugal
24 Rail and flange lubricators
1 Sewer cleaner
1 Spike puller
1 Tractor
6 Thermex bonding outfits
1 Wheeled scraper

Chicago, Milwaukee, St. Paul & Pacific

2 Air compressors
2 Bolt tighteners
1 Concrete mixer
2 Drills, rail
105 Motor cars, section and inspection
45 Motor cars, section
12 Motor cars, heavy duty
10 Power mowers
2 Power shovels
20 Trailers, motor car
4 Spike drivers
8 Tie cutters
8 Welding outfits

Chicago, Rock Island & Pacific

1 Adzing machine
4 Automobiles
2 Bolt tighteners
1 Concrete mixer
1 Concrete vibrator
2 Concrete busters
2 Drills, portable
1 Drill, rail
1 Drill, bonding
1 Grinder, rail, hand
1 Hammer, steam
80 Motor cars, section
40 Motor cars, inspection
2 Motor trucks
6 Mowing machines
1 Paint spraying outfit
1 Power ballasting machine
2 Pumps, portable
1 Saw
6 Tie tamping outfits
5 Welding outfits

Chicago, St. Paul, Minneapolis & Omaha

7 Motor cars, heavy duty
10 Motor cars, section
1 Motor car, inspection
1 Motor truck
2 Mowing machines
5 Push cars
1 Tractor
1 Welding outfit

Clinchfield

1 Air compressor
1 Jackhamer
6 Motor cars, section

Columbus & Greenville

1 Bolt tightener
1 Dragline and accessories
14 Motor car engines
14 Motor car frames
2 Mowing machines
1 Tie tamping outfit

Cumberland & Pennsylvania

2 Motor trucks

Dansville & Mount Morris

1 Motor car, section
1 Trailer, motor car

Danville & Western

1 Air compressor
1 Jackhamer

Delaware & Hudson

3 Bolt tighteners
1 Crane, crawler mounted
1 Gas engine and parts for ditcher conversion
1 Grinder, rail, hand
1 Grinder, crossgrinder attachment for
25 Motor cars, inspection
32 Motor cars, heavy duty
12 Motor cars, section
4 Mowing machines with snow plow attachment
1 Power track jack
1 Saw, high speed, rail
2 Tie tamping outfits

Denver & Rio Grande Western

2 Air compressors
2 Concrete mixers
1 Discer
8 Motor cars, inspection
2 Motor cars, section
5 Motor trucks
2 Mowing machines
1 Paint spraying outfit
1 Pump, centrifugal
23 Push cars
2 Spike drivers
2 Tie tamping outfits
2 Tractors

Denver & Salt Lake

1 Bulldozer
1 Drill, steel
1 Generator, portable
1 Pump, centrifugal
1 Power shovel
2 Saws
1 Tractor excavator
1 Tractor
1 Wrench, power

Detroit & Toledo Shore Line

4 Tie tampers

Detroit Terminal

2 Push cars
2 Rail and flange lubricators

Detroit, Toledo & Ironton

1 Dragline

1 Motor car, inspection
3 Motor cars, section

Duluth, Missabe & Iron Range
2 Air compressors
1 Air hoist
6 Concrete vibrators
16 Hammers, pneumatic
6 Motor cars, section
8 Motor cars, inspection
5 Motor cars, heavy duty
3 Motor trucks
2 Mowing machines
1 Paving breaker
2 Rail and flange lubricators
1 Tie tamping outfit
11 Trailers, motor car

East Erie Commercial
2 Motor cars, section
1 Motor truck
2 Trailers, motor car
1 Wrench, impact

East Jordan & Southern
1 Grinder, small

Elgin, Joliet & Eastern
1 Bolt tightener
1 Drill, rail
3 Drills, steel
21 Motor cars, heavy duty
4 Motor cars, inspection
6 Rail and flange lubricators
1 Rail cutting machine
1 Rail puller and expander
6 Tie tampers
7 Trailers, motor car

Erie
3 Air compressors
1 Air hoist
7 Bolt tighteners
1 Drill, rail
2 Grinders
4 Hammers, chipping
6 Hammers, rivet
1 Motor, reversible, air
9 Motor cars, inspection
11 Motor trucks
2 Mowing machines
1 Pump, sump
2 Pumps, centrifugal
26 Rail and flange lubricators
1 Rivet cutter
1 Rivet passer
1 Saw, pneumatic
2 Spike drivers
2 Tie borers
2 Tie tamping outfits
2 Weed burners
1 Welding outfit
1 Wood borer
2 Wrenches, impact

Fernwood, Columbia & Gulf
1 Weed burner

Florida East Coast
1 Motor car
5 Tie tamping outfits
1 Weed burner

Genesee & Wyoming
1 Motor truck
1 Paint spraying outfit

Georgia & Florida
1 Mowing machine

Georgia
2 Motor cars, section
3 Motor cars, heavy duty
2 Motor cars, inspection
1 Power shovel

Georgia, Southwestern & Gulf
2 Motor cars, section

Great Northern
1 Air compressor
1 Air motor, portable
6 Automobiles
1 Bolt tightener
1 Bus, 10 passenger
1 Concrete vibrator
1 Crane, rail
3 Creosoting units
2 Rail fissure detector cars
5 Drills, electric
1 Drill, portable
1 Electric line maintenance high car
1 Generator, portable
1 Grinder, bench
3 Grinders, hand
1 Grinder, rail, small
3 Hammers, rivet
2 Hammers, gas, portable
1 Hammer, pile driving
1 Ice boring machine
2 Jackhamers
1 Leak detector
2 Electric light plants, portable
1 Milling machine, portable
32 Motor cars, section
24 Motor cars, inspection
6 Motor cars, heavy duty
15 Motor car trailers
1 Motor truck with hydraulic lift and snowplow
45 motor trucks
1 Motor scythe
1 Electric nut runner
1 Pipe finder
2 Pumps, portable
1 Pump, centrifugal
1 Rail puller and expander
1 Ripper
1 Road ripper
2 Rivet cutters
1 Rivet heating forge, portable
2 Saws, electric
1 Saw, chain drag
1 Scarifier
1 Snowplow for attachment to automobile
1 Tank car unit
13 Tie tamping outfits
1 Tractor and earth boring machine
1 Tractor-plow
15 Trailers, highway
3 Weed burners
1 Weed mower
1 Winch and "A" frame
4 Wood borers
1 Wrench, reversible

Great Western
1 Motor car, inspection
1 Mowing machine
1 Paint spraying outfit

Green Bay & Western
3 Motor cars, section
9 Push cars

Gulf, Mobile & Ohio
10 Motor cars, inspection
60 Motor cars, section

Hoosac Tunnel & Wilmington
1 Crane

Houston Belt & Terminal
1 Bolt tightener
4 Tie tampers

Illinois Central
4 Adzing machines
4 Air compressors
5 Bolt tighteners
4 Concrete mixers
2 Cranes
3 Discers
4 Draglines
10 Drills
1 Grinder
40 Motor cars, section
5 Motor cars, inspection
5 Motor cars, heavy duty
13 Mowing machines
2 Paint spraying outfits
5 Pumps, centrifugal
10 Push cars
12 Rail and flange lubricators
8 Spike drivers
13 Tie tamping outfits
10 Tie tampers
2 Tractors
1 Welding outfit

Illinois Terminal
2 Motor cars, heavy duty
3 Motor cars, inspection
4 Motor cars, section
2 Rail and flange lubricators

Indianapolis Union
1 Motor car, inspection
3 Push cars

Kansas City Southern
1 Adzing machine
1 Bolt tightener, with attachments for drilling bolt holes
1 Grinder, hand
6 Motor cars, inspection
12 Motor cars, section
2 Motor car engines
1 Wrench, power

Laurinburg & Southern
1 Power shovel

Lehigh & Hudson River
1 Air compressor
1 Extinguisher car
2 Motor cars, inspection
5 Motor cars, section
1 Pump, centrifugal
3 Push cars

Numerous Roads Bought Power Tie Adzers and Spike Pullers for Use in Their 1942 Rail Laying Work

Lehigh & New England
1 Motor car, heavy duty
2 Motor trucks
6 Rail and flange lubricators

Lehigh Valley
3 Bolt tighteners
1 Crane, rail
2 Drills, rail
3 Drills, electric
10 Generators, portable
3 Grinders, pneumatic
3 Jackhamers
1 Motor car, heavy duty
3 Motor trucks
1 Mowing machine
3 Pumps, portable
3 Saws, electric
12 Scaling tools
1 Spike puller
35 Tie tampers
1 Weed burner

Louisiana & Arkansas
1 Crane
3 Motor cars, inspection
1 Mowing machine
1 Tractor, equipped with 15 ft. boom

Louisville & Nashville
2 Adzing machines
8 Air compressors
11 Bolt tighteners
10 Bull graders
4 Concrete mixers
4 Cranes, crawler mounted
4 Cranes, rail
9 Drills, electric
5 Drills, rail
9 Drills, reversible
18 Generators, portable
3 Grinders, switch point
1 Gunnite machine
47 Motor cars, inspection
50 Motor cars, section
12 Mowers, off track
3 Mowing machines, on track
6 Mowing machines, small power
7 Pumps, centrifugal
2 Saws, chain
6 Saws, electrical
2 Spike drivers
16 Tie tamping outfits
12 Trailers, motor car
18 Wrenches, power

Lowville & Beaver River
1 Automobile

McCloud River
1 Motor car, heavy duty

Maryland & Pennsylvania
1 Motor car, inspection

Minneapolis & St. Louis
1 Generators, portable
1 Motor car, inspection
9 Motor cars, section
2 Motor cars, heavy duty
2 Saws, portable
1 Wood borer

Minneapolis, St. Paul & Sault Ste. Marie System
A-Soo Line
3 Air compressors
1 Crane
2 Generators
6 Motor cars, inspection
10 Motor cars, heavy duty
25 Motor car engines
75 Motor car frames
2 Paint spraying outfits
1 Power shovel
6 Rail and flange lubricators

B-Duluth, South Shore & Atlantic
8 Motor cars, heavy duty
10 Motor car engines
20 Motor car frames
2 Trailers, motor car
1 Wrench, power

Minnesota, Dakota & Western
1 Welding outfit

Mississippi Central
4 Motor cars, heavy duty
1 Motor car, inspection
12 Motor car engines

Missouri-Kansas-Texas
2 Motor cars, inspection
2 Wrenches, impact

Maine Central
3 Adzing machines
2 Air compressors
1 Angle dozer
1 Bucket, clam shell
1 Crane, 15 tons
2 Discers
2 Drills, rail
1 Front-end loader
1 Grinder, rail, small
20 Motor cars, section
1 Mowing machine
6 Rail and flange lubricators
1 Saw, timber
1 Shovel, overhead for tractor
2 Snowplows
4 Spike drivers
2 Spike pullers
2 Tie pullers
8 Tie tampers
3 Tractors

Missouri Pacific Lines
A-Missouri Pacific
3 Adzing machines
2 Air compressors
1 Wrench, impact
1 Wrench, power

B-Gulf Coast Lines
1 Air compressor
1 Grinder
4 Motor cars, inspection
8 Motor car engines
5 Mowing machines
1 Pump, centrifugal
90 Tie tampers
1 Weed burner, portable

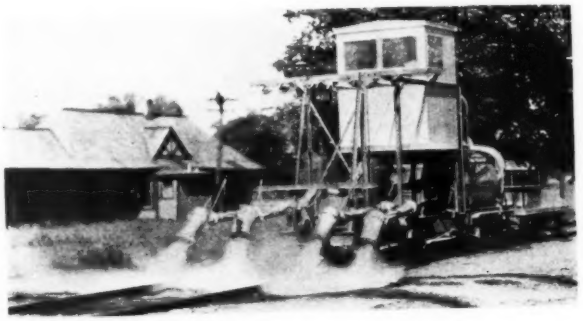
C-International-Great Northern
1 Air compressor
1 Bull grader
1 Concrete mixer
6 Motor car engines
112 Tie tampers

D-Missouri-Illinois
1 Motor car, inspection
2 Motor cars, section
1 Motor car, heavy duty
2 Mowing machines

E-New Orleans & Lower Coast
1 Tractor, mowing machine

Monongahela
1 Grinder
1 Motor car, inspection
3 Motor cars, section
1 Motor car engine
3 Motor trucks
3 Rail and flange lubricators
1 Spike driver
3 Tie tamping outfits
2 Tie tampers

Morehead & North Fork
1 Rail bender
1 Tie puller



278 Units of Weed-Destroying Equipment of Various Types Were Purchased By the Railroads During the Last 12 Months

3 Bolt tighteners
2 Concrete mixers
3 Concrete vibrators
1 Crane, rail
3 Draglines
1 Drill, rail
1 Drill, portable
1 Drill, rock
1 Hammer, pneumatic rivet
37 Motor cars, inspection
5 Motor cars, section
10 Motor cars, heavy duty
2 Motor trucks
26 Mowing machines
3 Paving breakers
4 Pumps, centrifugal
57 Rail and flange lubricators
2 Saws, chain
2 Saws, circular
2 Spike pullers
216 Tie tampers
3 Tractors
1 Trail builder
9 Trailers, motor car
2 Wheel scrapers, 5 yard

Mount Hood
1 Motor car, section
1 Mowing machine

Murfreesboro-Nashville
1 Motor car, section

Nashville, Chattanooga & St. Louis
2 Concrete mixers
1 Pump, centrifugal

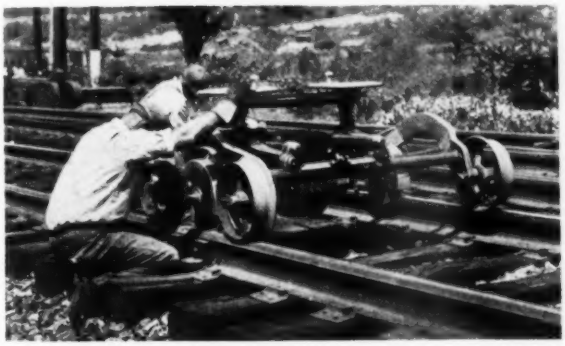
Nevada Copper Belt
1 Power saw

Nevada Northern
1 Motor car, heavy duty
1 Motor car, inspection
1 Motor truck
2 Push cars
3 Rail and flange lubricators

Newburgh & South Shore
1 Motor car, section

New Orleans Public Belt
2 Motor cars, section
2 Trailers, motor car

New York Central System
1 Adzing machine
2 Air compressors
3 Automobiles
5 Bolt tighteners
1 Concrete breaker
2 Concrete mixers
2 Discers, ballast
2 Twin bonding units
21 Drills, bonding



A Wide Variety of Grinders, For a Wide Variety of Purposes, Were Included Among the 1941 Purchases

9 Drills, portable
10 Drills, rail
3 Floodlights
8 Generators, portable
4 Grinders
17 Cross grinders
4 Grinders, portable
4 Grinders, rail, small
1 Hammer, steam
31 Motor cars, heavy duty
56 Motor cars, inspection
77 Motor cars, section
17 Motor trucks
45 Mowing machines
7 Paint spraying outfits
1 Pipe cleaning machine
1 Power shovel
8 Pumps, centrifugal
17 Push cars
26 Rail and flange lubricators
2 Saws, chain
1 Cut-off saw
6 Saws, portable
2 Saws, rail
2 Snow plows
1 Snow sweeper
27 Spike drivers
4 Spike pullers
11 Tie boring machines
40 Tie tampers
48 Tie tamping outfits
14 Tie tamping tools
1 Tractor
1 Trailer, highway
20 Trailers, motor car
1 Weed burner
5 Welding outfits
8 Wood borers
2 Wrenches, impact

New York, Chicago & St. Louis
3 Adzing machines
2 Air compressors
1 Concrete mixer
4 Drills, portable
4 Generators, portable
2 Grinders, hand
11 Motor cars, inspection
23 Motor cars, section
2 Motor cars, heavy duty
2 Motor trucks
1 Mowing machine
4 Saws, portable
2 Tie boring machines
4 Tie tampers
1 Tractor and excavator
2 Wrenches, power

New York, New Haven & Hartford
1 Adzing machine
6 Air compressors
12 Automobiles
5 Bolt tighteners
2 Bulldozers
4 Cranes, combination
2 Cranes, crawler mounted
10 Cranes, locomotive
12 Generators, portable
9 Motor cars, section
1 Motor car, inspection
62 Motor trucks
1 Paint spray outfit
1 Power ballaster
1 Power mower
1 Power shovel
1 Pump, centrifugal
12 Saws, chain
11 Saws, rail
1 Spike puller
70 Tie tampers
2 Tie tamping outfits
4 Tractors
3 Trailers, highway
1 Welding outfit
2 Wood borers
2 Wrenches, power

Norfolk & Western
4 Air compressors
1 Alligator shear
3 Automobiles
1 Ballast cleaning machine
4 Bolt tighteners
1 Bridge jack
1 Bucket, Clamshell
3 Cranes, combination shovel
1 Crane, electric
6 Drills, rail
2 Drills, bonding
2 Generators, portable power plants
3 Grinders,
8 Grinders, rail, small
2 Jackhamers
19 Motor cars, heavy duty
5 Motor cars, inspection
2 Motor cars, section
4 Pumps, centrifugal
13 Rail and flange lubricators
8 Rivet Busters
7 Saws, power
1 Saw, rail
6 Spike drivers
12 Tie tampers
1 Tractor
5 Wood borers
5 Reversible wood boring machines
1 Wrench, impact

Northampton & Bath
1 Paint spraying outfit

Northeast Oklahoma
3 Automobiles
1 Bus
1 Concrete mixer
1 Drill, bonding
2 Drills, rail
1 Grinder, portable
1 Hammer, riveting
2 Motor cars, section
1 Motor truck
1 Rail and flange lubricator

Pacific Coast
1 Motor car engine

Pennsylvania
4 Air compressors
1 Ballast cleaner, vacuum
2 Ballaster, power
22 Bolt tighteners
8 Concrete breakers
9 Cranes, rail
2 Cranes, crawler mounted
2 Discers
1 Earth borer
6 Generators, portable
24 Grinders
47 Motor cars
67 Motor trucks
14 Mowing machines
12 Paint spraying outfits
6 Pumps, portable
4 Saws, portable
1 Scarifier
10 Spike drivers
4 Tie borers
89 Tie tampers
34 Tie tamping tools
1 Truck attachment for snow plow
1 Weed burner with trailer
2 Weed burner extinguisher cars
4 Welding outfits
1 Wood borer

Peoria & Pekin Union
1 Air compressor
1 Cement gun

Pere Marquette
1 Bolt tightener
2 Cranes, rail
1 Grinder, rail, hand
45 Motor cars
1 Mowing machine
1 Motor scythe
1 Spike puller
3 Tie tamping outfits
12 Tie tampers

Pittsburgh & West Virginia
2 Motor cars, heavy duty
2 Motor cars, section
1 Rail and flange lubricator

Pittsburg, Shawmut & Northern
1 Motor car frame
1 Motor truck
1 Power shovel
1 Saw, portable electric
1 Welding outfit, portable electric

Quanah, Acme & Pacific
1 Motor car, heavy duty
1 Push car

Raritan River
1 Motor car, heavy duty
1 Push car

Reading Company
1 Bolt tightener
2 Coal conveyors, portable
2 Motor cars, heavy duty
1 Motor truck
1 Pile driver
25 Push cars
3 Rail and flange lubricators

1 Spreader-ditcher
440 Switch heaters
32 Tie tampers
1 Weed burner

Richmond, Fredericksburg & Potomac

1 Bolt tightener
3 Motor cars, heavy duty
2 Motor cars, section
2 Spike drivers
4 Tie tamping outfits
6 Trailers, motor car

St. Louis-San Francisco

6 Drills, rail
4 Generators, portable
2 Grinders, bench
10 Motor cars, inspection
2 Motor cars, heavy duty
7 Motor cars, section
1 Mowing machine, on-track
22 Mowing machines, off-track
8 Paint spraying outfits
100 Rail and flange lubricators
6 Saws, power
1 Tie tamping outfit
2 Tractors, with shovel
2 Wood borers, electric
2 Wrenches, electric

St. Louis Southwestern

1 Crane, crawler mounted
1 Grinder, rail, large
1 Grinder, rail, small
2 Grinders, cross
2 Motor cars, inspection
4 Saws, chain
1 Welding outfit, electric

Savannah & Atlanta

1 Grinder
2 Motor car engines
1 Mowing machine

Seaboard

3 Automobiles
13 Motor cars, inspection
6 Motor cars, section
2 Motor trucks
3 Mowing machines
4 Power shovels, combination dragline
39 Push cars
18 Rail and flange lubricators
6 Tie tamping outfits

Southern System

14 Air compressors
8 Angledozers
2 Cement guns
1 Concrete vibrator
3 Concrete mixers
2 Cranes, crawler mounted
16 Generators, portable
16 Grinders, portable electric
1 Grout Mixer
59 Motor cars, inspection
89 Motor cars, heavy duty
62 Motor cars, section
13 Motor trucks
1 Mowing machine
9 Paint spraying outfits
7 Pumps, centrifugal
2 Power shovels
18 Rail and flange lubricators
4 Rooters
17 Saws, portable, electric
6 Spike drivers
31 Tie tamping outfits
8 Tractors
7 Wagon scrapers
32 Wood borers
16 Wrenches, power

Southern Pacific System

A-Pacific Lines

2 Adzing machines
6 Air compressors
2 Angle dozers
2 Bolt tighteners
3 Carryalls
5 Concrete mixers
3 Concrete vibrators
4 Draglines
2 Drills, rail
2 Drills, bonding
1 Drill, rock
2 Grinders, rail
2 Hammers, steam
6 Jackhammers
1 Leak detector
89 Motor cars, inspection
47 Motor cars, section
37 Motor cars, heavy duty
47 Motor trucks
3 Mowing machines
4 Paint spraying outfits
4 Paving breakers
1 Pipe locater
1 Pitching machine
1 Power shovel, combination dragline
54 Rail and flange lubricators
1 Sheeps foot roller
1 Heavy type rooter
1 Saw, portable electric
24 Tie tamping outfits
3 Tractors
1 Weed burner
1 Wrench, impact

B-Lines in Texas & Louisiana

2 Adzing machines
9 Air compressors
1 Automobile
2 Bolt tighteners
1 Bucket, clamshell
1 Dragline
2 Flashlights
1 Generator, portable
1 Grinder, large
1 Grinder, stock rail
1 Grinder, rotary
2 Grinders, adzer bit
1 Hack fill blade
3 Hammers, impact
1 Hammer, steam
19 Motor cars, inspection
5 Motor cars, section
6 Motor cars, heavy duty
1 Motor truck
3 Mowing machines
4 Power jacks, bridge
1 Power shovel
6 Pumps, centrifugal
14 Rail and flange lubricators
1 Acetylene regulator
1 Oxygen regulator
1 Scraper, wood
1 Saw
1 Tie tamping outfit
34 Tie tamping tools
1 Oxy-acetylene cutting torch
3 Oxy-acteylene welding torches
2 Tractors
2 Welding outfits
1 Winch
6 Wood borers
2 Wrenches, impact
8 Wrenches, power

Spokane International

2 Motor cars, inspection

Spokane, Portland & Seattle

1 Angle dozer
2 Automobiles
1 Bucket, clam shell
1 Shovel bucket
1 Crane, rail
10 Drills, wood
6 Generators, portable
3 Motor cars, heavy duty
9 Motor cars, section
4 Motor cars, inspection
4 Motor trucks
1 Rail layer, 3 men
1 Scarifier with accessories
1 6-yd. scraper
2 Tie tamping outfits
1 Tractor

Strouds Creek & Muddlety

1 Motor car, section

Tennessee Central

1 Motor car, inspection
1 Paint spraying outfit

Tennessee

1 Air compressor
1 Jackhamer
2 Motor cars, section
2 Push cars

Terminal Railroad Association of St. Louis

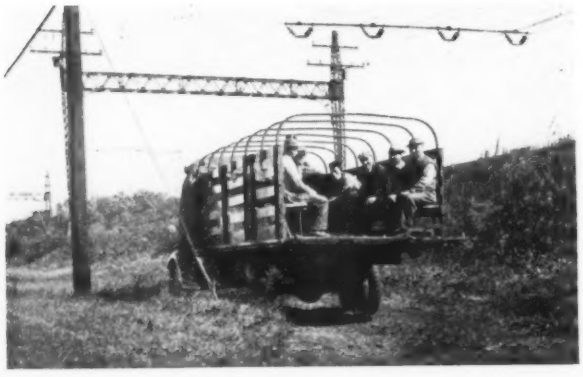
4 Air compressors
1 Breaker, paving
1 Crane, locomotive
4 Grinders
1 Grinder, small
3 Hammers, riveting
1 Motor car, inspection
5 Motor cars, heavy duty
1 Motor car, section
2 Paint spraying outfits
7 Push cars
10 Rail and flange lubricators
4 Tie tamping outfits
2 Tractors
1 Weed burner
2 Welding outfits
2 Wrenches, impact

Terminal Railway Alabama State Docks

1 Motor car, inspection

Texas & Pacific

2 Automobiles
1 Bolt tightener
1 Crane, rail
1 Grinder, small
14 Motor cars, heavy duty
13 Motor cars, inspection
136 Motor cars, section



424 Motor Vehicles Were Purchased for the Maintenance of Way Forces in 1941

1 Motor truck
4 Mowing machines
2 Pumps, centrifugal
6 Rail and flange lubricators
2 Tie tamping outfits
1 Weed burner

Texas Pacific—Missouri Pacific Terminal Railroad of New Orleans
1 Motor car, section

Toledo, Peoria & Western
3 Grinders
1 Motor car, inspection
2 Mowing machines
12 Push cars

Toledo Terminal
1 Automobile
1 Drill, rail
1 Mowing machine
2 Tie tampers

Trona
1 Air compressor
1 Bolt tightener
1 Grinder
1 Motor car engine

Portable Generators and Power-Driven Tools Are Increasing in Favor

1 Spike driver
4 Tie tamping tools
1 Wrench, impact

Tuskegee
1 Motor car, section

Union Railroad
1 Air compressor
4 Breakers, paving
1 Drill, bonding
2 Drills, portable
1 Drill, rail
1 Drill, reversible
4 Grinders, rail, hand
4 Hammers, chipping
3 Hammers, riveting
2 Paint spraying outfits
2 Rotary wire brushes
13 Scaling tools
1 Track shifter
1 Welding outfit
1 Wrench, impact

Union Railway
1 Bulldozer
2 Motor trucks
2 Rail and flange lubricators
1 Tractor

Utah Railway
1 Air compressors
1 Grinder

The Continued Purchases of Mechanical Aids for Tie Renewal Work Show That There Is a Large Need in That Direction

2 Motor cars, heavy duty
1 Spike driver
4 Tie tamping tools

Virginia Blue Ridge
1 Motor car, section
2 Motor trucks

Virginian
1 Bolt tightener
1 Concrete mixer
6 Motor cars, inspection
1 Motor car, heavy duty
2 Push cars
11 Rail and flange lubricators

Wabash
1 Bolt tightener
4 Grinders, rail, small
2 Mowing machines
1 Power ballaster
2 Saws, rail
1 Scarifier
20 Tie tampers
1 Tie tamping outfit

Warren & Saline River
1 Motor truck

Western Allegheny
1 Grinder, hand
1 Paint spraying outfit
2 Rail and flange lubricators
1 Saw, electric
1 Wood borer

Western Maryland
1 Air compressor
2 Jackhamers
1 Motor car, inspection
3 Motor cars, section
7 Motor trucks
2 Pumps, centrifugal
1 Saw
16 Tie tampers
1 Wood borer, reversible

Western Pacific
2 Air compressors
1 Cement gun
1 Generator, portable
3 Motor cars, section
4 Motor cars, inspection
3 Motor trucks
1 Paint spraying outfit
8 Tie tamping outfits

Wheeling & Lake Erie
1 Automobile
2 Motor cars, heavy duty
4 Motor cars, inspection
6 Motor cars, section
3 Motor trucks
12 Push cars
1 Well drilling outfit

Yosemite Valley
1 Generator
1 Motor car, heavy duty
1 Paint spraying outfit
2 Push cars
2 Rail and flange lubricators
1 Weed burner
1 Welding outfit

Canada

Alma & Jonquieres
1 Motor car

Canadian Pacific
1 Concrete mixer
4 Cranes, crawler mounted
1 Crane, rail
1 Diesel engine
2 Drills, electric
1 Drill, pneumatic
1 Drill, rail
1 Generator, portable
6 Grinders, rail
21 Motor cars, inspection
2 Mowing machines, track mounted
1 Paint spraying outfit
22 Rail and flange lubricators
2 Saws, rail
1 Saw, portable
10 Tie tampers
2 Tractor graders
1 Wood borer

Midland Railway of Manitoba
1 Weed sprayer

Newfoundland
1 Air compressor
1 Generator, portable
2 Motor cars, inspection
1 Power shovel
1 Welding outfit

Northern Alberta
2 Motor cars, inspection
1 Motor car engine

Quebec Central
1 Drill, rail
2 Saws, rail

Temiskaming and Northern Ontario
1 Power shovel
2 Tie tamping outfits

Toronto, Hamilton & Buffalo
1 Air compressor
1 Grinder, rail, small
1 Motor car, heavy duty
3 Motor cars, section
1 Paint spraying outfit
6 Tie tampers

Mexico

Southern Pacific of Mexico
6 Motor car engines
12 Motor car frames
10 Rail and flange lubricators

Must Protect

Key Bridges, Tunnels and Terminals, Because of Their Very Nature, Are Attractive to the Saboteur, and Must, Therefore, Be Given Special Attention by Railroad Men

Speaking before the forty-eighth annual convention of the American Railway Bridge and Building Association in Chicago on October 15, Mr. Coffey, representing J. Edgar Hoover, tells bridge and building men that attempts at sabotage will come, and that it is up to them to protect their structures. He offers full co-operation on the part of the F.B.I., but urges the importance of self-reliance and eternal vigilance on the part of all railway employees

E. P. Coffey

THE Federal Bureau of Investigation, under the direction of J. Edgar Hoover, was charged by the President in September, 1939, with the co-ordination and handling of all matters pertaining to sabotage, espionage and similar matters concerning our internal defense. Shortly after that, the authorities of the army and navy requested Mr. Hoover to undertake to survey the manufacturing plants of the country engaged in defense contracts, with a view to making recommendations which would protect these plants against sabotage and other hazards which might be inimicable to the national defense program. This work has now been going on for two years, and more than 2,000 of these plants have been surveyed by special agents of the F.B.I. This program is a precautionary one and important, because it is felt that every effort made to prevent any interruption of the defense production program, no matter how slight, is very important.

Bridge Men Have Responsibility

You gentlemen are charged with an equally important task. It will be of little avail to produce and manufacture the defense needs of the nation if they cannot then be shipped successfully to the points of greatest utilization. The railroads of the nation constitute the great transportation system in our defense program. The protection of their bridges thus becomes one of the most important tasks in the present national emergency. Those who would destroy and interrupt our nation's defense program will endeavor cunningly to attack those points which are not only certain to disrupt things seriously, but which are of such a nature that their repair or replacement is most difficult. To block the right of way of a main trunk line, for instance, might stop transportation effectively on that line temporarily, but removal of the barricade would probably require only a short time and normal operations would soon be resumed.

When an important railroad bridge is attacked, however, it not only blocks current transportation effectively, but it becomes a major piece of engineering and reconstruction, requiring, perhaps, many weeks, if not months, before repairs or replacement can be made. Bridges, by their very nature, are attractive to the saboteur, because, frequently, most complete destruction can be effected by a relatively small attack on a crucial part of the structure. I point these things out to you to emphasize the importance of your job, and to urge you to greater ingenuity and greater alertness in the protection of these strategic structures. The history of past wars is replete with reports of bridge destruction as a primary form of attack. Attempts at bridge destruction by saboteurs and fifth columnists may be expected. It is the job of you men to do all in your power to prevent this.

Many of you already have plans under way for the proper protection and maintenance of your bridge structures during this emergency. If you have not begun to plan this work, it should be started at once. You must not anticipate that the military authorities, the state or local police, or some home guard unit will protect your bridges. It is quite possible that in some instances, some of these governmental organizations will undertake the protection of a particular bridge for a particular reason. But it is upon your skill and experience as bridge maintenance men that the nation will have to depend to safeguard

Railway Structures Against Sabotage

By E. P. COFFEY
Chief of Technical Laboratory
Federal Bureau of Investigation
Washington, D. C.

all other structures. Of course, the railroads will not stop with the protection of their bridges. Their right of way, docks, shop buildings, yards, roundhouses, terminals, and freight houses and warehouses are all important factors in the nation's transportation system, and for the very fact they are important, become objects of possible attack by the saboteur.

Report Sabotage Promptly

As I have already indicated, the Federal Bureau of Investigation is charged with the responsibility of investigating sabotage and attempts at sabotage. It becomes important, therefore, that you see that the personnel under your supervision knows that the F.B.I. should be called promptly by telephone whenever any sabotage or attempt to sabotage occurs, no matter how small. It is important that the F.B.I. be called promptly so that its special agent may reach the scene of the crime early enough to make a detailed study for any clues which will lead to the identity of the saboteur. It is important even though the attempt seems a minor one, because it may actually be found by agents of the bureau to be connected with a major operation of sabotage being carried out over the entire country.

The agents of the F.B.I., especially trained in the investigation of sabotage, may be able to recognize the method of operation from previous cases in which a like attack was made. When they prepare their detailed reports of their investigation at the scene of an accident or seeming accident, the reports are forwarded promptly to Washington where specialists in the detection of sabotage review them closely and co-ordinate them with other similar cases from perhaps entirely different parts of the country. This system, providing in a sense a clearing house for information, permits the F.B.I. to maintain a bird's-eye view of the situation over the entire nation at one time. Waves of sabotage may thus be recognized quickly and the necessary action taken.

F.B.I. Has Trained Investigators

The F.B.I. maintains a technical laboratory at Washington, staffed with more than 65 scientific men and 45 cryptographic employees, whose job it is to make a scientific study of the physical evidence found at the scene of the crime. In cases of sabotage, this evidence is frequently of the utmost importance, and its scientific analysis is sometimes the most important, if not the sole clue to the criminal. For instance, experts are specially trained in the analysis of lubricating oils which have been diluted or contaminated by the saboteur in an effort to destroy important machinery. The destructive element is reduced and identified, and in this manner can frequently be traced by the field investigators to its source, which sometimes leads to the saboteur.

Abrasives, such as ground glass, emery dust or steel filings, are sometimes thrown into important bearings, and there accomplish destruction. These tiny bits of material are examined microscopically, and sometimes chemically and spectrographically, in the laboratory, and their nature determined. Subsequently, when investigating agents produce sample materials from suspected sources, these are likewise analyzed and compared as to kind, quality and size with the material used to do the damage.

Experts in soil analysis examine mud removed from the tires or fenders of automobiles suspected of having been driven to a point where sabotage was committed, and compare this with the soil at the scene of the crime. Other experts study tool marks left in metals during sabotage attempts. Sometimes the screw driver or hammer used to gouge into finely made bushings or other precision parts can be identified definitely as the tool which made the particular mark.

Streamliner Wreck Studied

A year and a half ago an important sabotage case was studied in the bureau's laboratory, in which practically all of our scientific procedures were utilized in reaching certain final conclusions. In this case, a transcontinental streamlined train was wrecked. A rail had become moved at the approach to a bridge over a stream and canyon. This happened in such a manner that the train would be thrown against the bridge and into the canyon. Part of the train escaped across the bridge, but several of the cars fell down the embankment.

The statement of the engineer in this case suggested sabotage, but the rails had been torn up by the wreck and there seemed to be little evidence to offset a staunch suggestion that carelessness on the part of the company caused the wreck. Laboratory experts of the F.B.I. examined the scene, and subsequently studied much of the evidence in Washington. The rail displaced, for more than half its length, had been painted on its running surface with a dark brown paint.

Was this done by the saboteur, supposedly, to kill the reflected gleam from the headlight of the train, upon which the engineer would depend to assure him that the track ahead was clear? Ugly rumor suggested that this rail had been painted after the wreck.

The Diesel engines of the train had negotiated the bridge successfully, although they were off the track. Scrapings were noted on the painted rail. The experts proceeded several hundred yards from the point of derailment to where the Diesel engines rested. Climbing beneath them, they scrutinized every bit of the undercarriage, and there found small scrapings of the dark brown material. This was analyzed spectrographically and was found to be paint—paint of the same color and composition as the paint used to disguise the rail several hundred yards back. This established positively that the rail had been painted at the time the Diesel engines left the track. Other laboratory analyses identified the manufacturer and particular brand of paint, and, subsequently, a small paint can was found discarded near the wreck.

In dragging the creek above the point where the wreck occurred, a bundle of track tools was found tied up in two zipper leather jackets. Included among these were claw bars and track wrenches. Toolmark experts of the F.B.I., using precision comparison microscopes, were able to prove that these were the tools used to remove the spikes and bolts in shifting the rail. The criminals responsible for this sabotage have not yet been located. At the time the wreck occurred there was no Federal law which would cover such an offense, and the Bureau's efforts in this case were limited necessarily to making its laboratory facilities available to the railroad police and the local law enforcement authorities.

Laws Against Sabotage

On June 8, 1940 the President approved a law which makes it a Federal crime to wreck or attempt to wreck a train engaged in interstate commerce. This law covers any willful and unlawful attempt at such wrecking, and refers specifically to the firing or exploding of tunnels, bridges, viaducts and trestles. This is the principal peace-time statute which gives the F.B.I. investigative jurisdiction over attacks on your bridges. Another peace-time statute which, in some instances, might have effect, is that which covers violent interference with foreign commerce, and makes it unlawful to obstruct in any way the exportation to foreign countries of articles from the United States. In time of war, the Federal statutes dealing with sabotage are more embracive and provide more severe penalties. It is because of these laws that it is so important for you to report promptly to the nearest office of the Federal Bureau of Investigation, any attempts at sabotage which

Defense Traffic Must Be Kept Moving

come to your attention in the performance of your duties of maintaining and protecting the railroad bridges of the United States.

Study Weaknesses

Planning the protection of your bridges against sabotage is a big job that requires careful planning. This planning should begin with detailed surveys, in which you men, as experts on bridges, will study the vulnerability and weaknesses of your structures from the standpoint of sabotage. This study should include the approaches along the right of way, a determination of the best manner in which the bridge can be guarded or patrolled. Consideration of the possibilities of attack from below is very important. Not only may supporting piers be fired or exploded, or cut by hand, but where rivers or streams are concerned, consideration must be given to the possibility of floating explosive or crushing devices against the piers, released from a point higher up the stream. A serious threat is that in which the bridge is wrecked or blocked by causing a heavily laden train to be wrecked as it crosses. Drawbridges require special attention to protect their operating mechanisms. These may be jammed so that the draw cannot be lowered or the mechanism may be tampered with in such manner that the draw operates wrongly at the approach of a train. Where these are operated electrically, special attention must be given to the protection of the source of electric power and to the transmission lines to the bridge.

Study should be made to determine the weaknesses of your bridge structures, and plans made to strengthen them. Sabotage is frequently made to appear as an accident. Thus, advantage may be taken by the saboteur of existing structural defects or natural fire hazards on the bridge, such as where wood ties are exposed or wood underpinning is not made fireproof. Other seeming accidents may result from landslides on the bridge or on its approaches. All of these hazards should be given prompt study and plans for meeting them worked out.

As the need for protection grows, it will be necessary to guard many bridges, particularly those carrying the most important traffic and those in the most vulnerable places. These, possibly, will include the international boundary bridges and the huge bridges connecting key points, where a serious bottleneck is sure to result if any of them is rendered useless. In guarding these bridges, consideration should be given to the desirability of fencing approaches, and, in some instances, carrying this fencing at least partly into the water so that the legitimate openings through which trespassers might enter can be watched more easily. Proper lighting should be given study. At times, this is most effective in detecting trespassers, and is just as important in acting as a deterrent to frighten them away. Answers to questions concerning the number of guards, the hours when they will work, their method of standing guard at approaches or patrolling the bridge itself, as well as to all other local questions, will depend entirely upon the specific point and situation to be guarded. Your experience during the last war should be most important to you in planning safeguards during the present emergency.

Planning Not Enough

The planning and installation of safeguards and patrol systems are not enough. They must be rigidly maintained and strictly enforced. It is a natural human tendency to drop our guard after the first day or two of initial excitement with a new job. This is the great danger with guards and protective systems. So it becomes a maintenance job—a job not only of maintaining the physical safeguards, equipment and system itself, but of maintaining a sharp alertness and enthusiasm in the personnel upon whose shoulders rests the actual job of guarding structures. Frequent checks and inspections become necessary. The

(Continued on page 39)

Tests Motor Cars With Dynamometer

THE testing of track motor cars is now accomplished on the Lehigh Valley by means of a dynamometer that has been installed in this company's shops at Sayre, Pa., especially for this purpose. This device, by means of which any desired load can be applied to the wheels of a motor car, is used to determine the condition of these cars, either before or after they are overhauled, and to furnish a load for breaking in motor cars in which the engines have been overhauled. When a car is being tested, the output can be read directly from meters mounted on a panel board placed adjacent to the dynamometer.

The Principle

This dynamometer is of the type in which the output of the machine being tested is transmitted from the driving wheels of that unit to another set of wheels which is provided with suitable means of measuring the output. In this instance a pair of dynamometer wheels are set into the floor in such a manner that the driving wheels of a motor car can be placed directly on them. Thus, while the motor car remains in a stationary position, the engine can be placed in gear so that the driving wheels cause the dynamometer wheels to revolve. Since any desired resistance to turning can be set up in the latter wheels, actual loads on the motor car can be simulated.

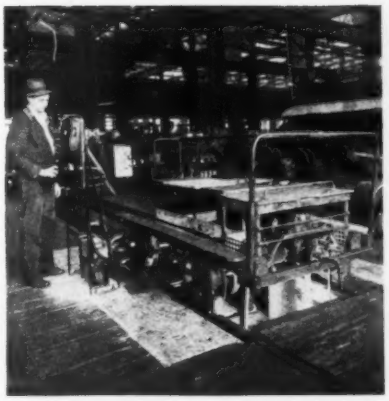
The dynamometer at Sayre is located in the erecting shop near one end of an inspection pit. To make a place for the dynamometer wheels, short sections were removed from the track rails and the pit was widened sufficiently to permit the wheels to be installed in the gaps in the rails. The wheels were made specially for this installation and are each fitted with a 28-in. by 3-in. motorcycle tire. They are mounted on a jackshaft, 1⅜ in. in diameter, mounted on Timken roller bearings. The wheels project slightly above the tops of the rails.

Generator Furnishes Load

Mounted on the jackshaft is a 20-in. by 4-in. pulley which is connected by a 4-in. rubber belt to a 7-in. by 4-in. pulley mounted on the shaft of an electric generator. The latter unit was originally designed as a 7½-hp. variable-speed 220-volt motor, but it was converted into a generator by paralleling the fields. In order that the desired control may be exercised over the generator field for the purpose of varying the load on the motor car, the field is connected with a rheostat which is mounted on a small control panel placed at one side of the pit.

The output of the generator is absorbed by a load resistance consisting of two banks of motor-starting grids, connected in series across the generator armature. For measuring the load presented by the generator, two General Electric meters are provided, which are also mounted on the panel. One of these is a voltmeter registering from 0 to 300, while the other is an ammeter calibrated from 0 to 50.

When the dynamometer is in use, a portion of the pit at the jackshaft is covered with a metal plate which embodies slots for receiving the dynamometer wheels. This plate bridges the gaps in the rails and allows the motor car to be rolled over the pit and placed in postion for testing, with the rear or driving wheels resting on the dynamometer wheels. To hold the car stationary during the test, the front wheels are held in chocks clamped to the rails. When the engine is started and the car thrown into gear, the car wheels drive the generator, causing the output of the engine at the rail, minus the dynamometer losses, to be shown by the meters.



Showing a Motor Car in Position on the Dynamometer

Dynamometer Losses

If it is desired to determine the actual horsepower output of the car, it is necessary to ascertain the losses in the dynamometer throughout the range of the load. This can be done by driving the dynamometer with a motor, the efficiency of which is known. If the efficiency of the motor is not known, it can be determined by making a brake test, with a friction brake, torque arm and scale, to measure the torque. In actual practice it is usually satisfactory simply to compare cars being tested with one known to be in good condition.

Since the testing is done in the shop, it is necessary to dispose of exhaust gases from the engines. For this purpose two vertical 2-in. exhaust pipes are provided in the pit, the ends of which fit over the two exhaust pipes on each motor car engine. The pipes in the pit are brought together with fittings and carried out of doors as a single 2-in. pipe. A ⅛-in- pipe connected to the shop air line is run into the exhaust pipe so that its open end points toward the outer end of the exhaust pipe. This acts as an ejector to keep fumes from leaking out into the shop and to avoid the building up of back pressure which would affect engine operation. The flow of air through the ejector is governed by a valve.

View of the Motor Car Dynamometer. Note Tires of Dynamometer Wheels Protruding from Slots in the Metal Plate

Streamlining

Men, Methods, Materials and Equipment Hold the Key to Adequate Maintenance in the Strenuous Days That Are Ahead

A. E. Perlman

THIS country is facing a grave emergency, and the railroads, taking all in their stride, are meeting all demands. Yet the railroads face an emergency more acute than that confronting any other industry in America, for we must look beyond the present era to the post-war days which are to come. Days when the great air transports released from military service will carry the major portion of our present long-haul passenger traffic, with an ever-increasing percentage of mail, express and freight. When there will be a vastly improved network of highways, lowering the cost of truck transportation. When pipe lines now being projected will convey part of the present rail traffic, and new inland waterways will carry a vastly augmented merchant marine and provide added competition.

We must face the future without wishful thinking if we are to keep the railroads dominant in the transportation industry—take advantage of every known improvement in methods and materials, and make exhaustive research into newer and better practices. We must spend more time in selecting and training our men. Today, as never before, we are feeling the effects of the early thirties, when finances did not permit the training of understudies. The head of a railroad department is only as effective as his far-flung subordinates who supplement him. They will reflect the care with which he has selected and the time spent in training them.

Long-Range Planning

Maintenance officers must be given the authority to carry out their responsibilities properly and be permitted to make long-range programs in order that their work may be carried out expeditiously and economically. I think this is a most important matter. We have seen the effect on many railroads of month-to-month budgeting of maintenance expenditures on the basis of current or prospective traffic. They are not permitted to enlarge spring programs because they are not willing to show a poor maintenance ratio during this period. They want to spend all their money in the fall, when traffic is moving. That means that the ultimate costs of doing their work will be greater. The railroads as a whole now are trying to get away from this costly practice, and, to a larger extent are seeking to do their work at the time when it can be carried out in the most economical manner, and with the least interference to traffic. This is especially important at this time, when the railroads are carrying peak loads.

Construction and maintenance projects should be so scheduled and coordinated that modern machinery can be purchased and kept in operation the entire year. Thus, a dragline used part of the year for extending passing tracks can be used the remainder of the year for filling bridges, ditching cuts, widening banks, loading stock car bedding sand, and numerous other duties. Construction projects necessitating slow orders can be planned for periods of light traffic, and machines put on work in locations where they can be readily available to take care of serious traffic interruptions due to storms or other conditions. With such long-range planning and budgeting, materials can be ordered sufficiently in advance to prevent delays to the work.

Need Unit Cost Data

Detailed unit costs must be furnished supervisors as a guide to the most efficient men, methods and materials. Such data will bring out some very interesting facts. For example, last year we tested certain machines which two of our roadmasters said would increase by more than 50 per cent the production of section gangs in carrying out a certain operation. For three months we watched the unit costs on the sections having these devices, and actually found them to be higher than on the adjoining section which were doing the same work manually.

Without unit costs it is impossible to make authoritative recommendations for new types of equipment. This accounts for the fact that many roads are still using steam ditchers to handle dirt at a cost of 35 cents to one dollar a yard, when crawler-type Diesel machines can be purchased which will do the same work for three to five cents a yard. These machines can be equipped with snow-blade attachments, winches for handling riprap, blades for cutting brush, post-hole diggers, and numerous other ac-

Maintenance Practices

To Meet Defense Problems

In this paper, the author calls for long-range planning; study of unit costs; greater use of scientific research; and more effective use of modern work equipment to meet the problems of the day, and also the problems of the post-war era, which he says will be still more critical

By A. E. PERLMAN

Chief Engineer
Denver & Rio Grande Western,
Denver, Colo.

cessories, so that they can be kept in service during the entire year, with almost unbelievable economies in expenditures. A bulldozer attachment makes them invaluable for clearing derailments, or for building a shoofly to get traffic moving without delay. I don't believe many railroads realize the huge savings that can be made with this off-track equipment, and part of it is due to the fact that our costs are kept for Interstate Commerce Commission purposes rather than for our own use.

Keeping proper cost records not only permits a comparison of different types of equipment, but also provides a factual record of operator efficiency and cost of delays, and forms the basis for the accurate control of expenditures. In addition, it permits accurate estimating in making up AFEs for new work. On our 2,500-mile road, three men in the engineering department, who receive copies of all daily work reports, keep unit cost records and also keep records of expenditures for the entire system.

Scientific Analysis Needed

Car builders have shown marked progress during recent years in the building of light-weight freight and passenger cars, employing alloy steels. Likewise, if we will, it is possible through the use of photo-elastic methods to secure substantial weight reduction in track materials by eliminating bulks which sustain no loads or play no part in supporting loads. We have given little consideration recently to the use of alloy steels in track materials, due to their higher cost and to the fact that the defense program is taking most of the alloy steels available.

Through photo-elastic studies we can determine where stresses will concentrate under a given load, and can also determine the intensity of those stresses in any portion of the material studied. Four-hole or six-hole joint bars, the size of track bolts, the proportioning of tie plates, the section of rail, and many like subjects, have been under discussion for years. In these discussions, the human equation has far outweighed the mathematical one, and the appointment of a new chief engineer has sometimes resulted in the complete revision of existing standards. Today, we can supplement our own opinions and calculations with scientific aids, which open new vistas in meeting problems of design. For years we have kept a record of failures in rail and fastenings, but today we can find the causes of these failures through the study of stress concentrations, etch tests, microphotographs, fatigue tests simulating service conditions, X-ray diffraction tests for determining residual stresses, and Magnaflux or X-ray inspection to determine defects in materials through improper manufacture, or to determine the presence of service defects before failure occurs.

Many of you men, located where winters bring severe cold, have had spread rods in your track in certain locations where heaving track has called for three- to six-inch shims. In the Northwest, where concrete highways began to heave and break up during the winter, research in soil mechanics showed that the heaving could be eliminated. Applying these same principles to track, slow orders due to heaved track are no longer necessary.

Investigating a heaving track condition in the Northwest, research at the University of Minnesota disclosed that a certain type of silt was bringing water up in the soil through capillary attraction. When this hit the frost line, it formed a thin film of ice. Further moisture rising stopped at this ice film, and, before spring there was a layer of ice six to eight inches thick under the ties. By merely digging out the offending silt and backfilling with some other type of material like sand or gravel, the heaving was entirely overcome. Slow orders due to slides and soft spots can also be eliminated through a knowledge of soil mechanics and the assistance of competent geologists.

Calls For Action

We will have gone a long way toward streamlining our operations when we ask, "Why?" every time we see a low joint, a heaved spot, a cracked angle bar, or a corrugated rail. As an example, a study of failures in welded track and in welds applied to other structures has shown the predominating cause to be improper finishing, the weld itself being of sufficient strength. Sharp edges and corners left on the surface were shown to be stress raisers, resulting in failures in track. One of the most important causes of failures in bolt holes has been found to be sharp edges left around these holes after drilling. This matter of insufficient care in finishing seems, on the surface, to be of small consequence, but it is known to have resulted in serious fatigue failures in rail, switch rods and bolts. Careful observations of the men in the field, brought to the attention of designers and planners in the office, are necessary to a proper balance in our operations.

How, then, can you directly help

to streamline maintenance operations, provided you are allowed to program your work for the year and receive unit costs covering the work of the men and equipment under your jurisdiction? In coming to this convention you have been permitted to hear reports covering modern methods, machines and materials now in use on other railroads. The majority of you have ridden over lines other than your own to attend this gathering. If you have come here with the attitude that you can go back home and tell the other boys how much better your property is than the other railroads you inspected, your time has been wasted.

On the other hand, if you came here to learn how your methods could be improved, and have gained the urge to work on some committee where you can pool your experience with that of men from the North, South, East and West, your railroad, and the railroad industry as a whole, will benefit greatly. If you leave with the realization that the labor expended on your district must be used in constructive work to build up the property, rather than to merely maintain it, this will have been a profitable trip; for today we must work with the view that every project we undertake will give us a more permanent way, so that in the lean years to follow we will not be burdened with unproductive expenditures.

When a low spot develops repeatedly in the track, don't just drop a butterfly to tell the foreman that it needs spotting up, and then forget about it. Perhaps an inspection might show that a water pocket requires draining, or that a stretch of ballast has been fouled by a wash-in. If you have a spot in the track which heaves chronically every winter, a study of the soil conditions might permit you to eliminate the expense of constant shimming. If you have track watchmen or slow orders at slides or soft spots, the advice of a geologist may help you overcome the trouble. If an epidemic of broken bolts or angle bars develops, call it to the immediate attention of your engineering staff. If you see a new machine being used by a contractor or some outside industry, which might be used to advantage by your railroad, make inquiries about it.

Research Essential

You will be surprised to find how many things we can learn from other industries. When we were making a study of the corrosion of rail in the Moffat tunnel, we found that the General Motors Company was concerned with the same problem in the crankcases of its automobiles. The metal in both instances was being attacked by sulphurous acid, although our engines burn coal and its automobiles burn gasoline. That company found that the only solution to the crankcase problem was increased ventilation, and after exhaustive tests by our research engineers we came to the same conclusion in regard to steam operation in the tunnel.

Face Crucial Post-War Era

The success of Diesel engines in railroad service is, in large measure, due to research that has developed satisfactory additives for oils. Oil as ordinarily refined was not satisfactory. Concentrated research by the oil and motor industries developed additives which have made Diesels successful for locomotives and off-track equipment. Without that research, the development of Diesels to their present state would have been impossible.

I hope that you will become imbued with the full realization that the defense era for the railroads will be most crucial after our country emerges from the production peaks into which chaotic world conditions have forced us. For then we will face a test requiring adjustments reaching far deeper than those of the last decade —a test in which our best defense will be a concerted offense, placing research and observation at work, unhampered by past practice.

Portable Generators Prove Worth on Emergency Job

THAT the availability of portable electric generators is an important factor in expediting bridge-repair operations that must be conducted at night was demonstrated during an emergency repair job that was recently carried out on an eastern road. The site of this particular job was a bridge washout. The structure involved was a masonry culvert at which a large gap was cut through the roadbed during a period of high water.

In making emergency repairs, it was decided to span the washout with a plate-girder bridge supported on timber-pile abutments. The installation of a structure of this type obviously necessitated the performance of a considerable amount of timber-framing work on the ground, such as dapping ties, boring bolt holes, and cutting off piles. To expedite the repair operations, the railroad desired to utilize on the job a variety of portable electric power tools and to carry on the work day and night, illuminating it at night with floodlights.

A Typical Night Scene On the Job, Showing the Use of a Portable Generator for Operating Power Tools and Floodlights

Four Generators Used

Since there was no power supply available locally, four Homelite 3,000-watt portable gasoline-engine-driven generators were utilized to furnish the necessary power. Sufficient floodlights were plugged into the generators and spotted at strategic points on the job to illuminate the different operations so that they could be performed with daylight efficiency. The portable tools that were utilized on this job included timber saws of different sizes and wood augers. Thus, by effectively illuminating the work at night and by making it possible to utilize portable power tools, with their recognized advantages over hand methods, the four generators constituted an important factor in helping to reduce to a minimum the time required to complete the work and get the line back into service.

Must Protect Against Sabotage

(Continued from page 34)

same alertness and enthusiasm that you expect in your men must be ever evident in yourself, or you will fail to inspire them.

These are some of the highlights of the problem. The details must be worked out locally and co-ordinated with your own railroad and maintenance problems. You may be certain at all times of the desire of Mr. Hoover to assist you in these problems. He is deeply appreciative of the co-operation that the F.B.I. has always had from the railroad police of the country. He is certain that you men, as engineers and supervisory officers, will work out successfully the problem of protecting railroad structures. And, if sabotage occurs, you may be equally certain of a vigorous, far-reaching and detailed investigation on the part of the Federal Bureau of Investigation to bring to light these nefarious criminals who attack the defenses of our nation.

N. & W. Announces Annual Track Awards

THE practice of making annual track inspections for the purpose of determining the condition of the company's tracks and of rewarding section foremen for excellence in track maintenance was continued on the Norfolk & Western in 1941. As a result of the inspection for this year it was found that the track condition had improved further to a new all-time high, the property as a whole being rated at 9.40, which compares with 9.38 in 1940, the previous high. The rating of 9.50 is the highest that can be given.

With a rating of 9.45, the Scioto division, as in 1940, held first place among the company's five divisions, while the Norfolk terminal, with a rating of 9.44, was judged the best-maintained terminal on the road. Among the roadmasters' territories, Districts 18 and 19 of the Scioto division, each with a rating of 9.46, were tied for first place. In 1940, District 19, Vera, Ohio, to Cincinnati, held first place alone, while in 1939 it shared first-place honors with District 18, Greggs Hill, Ohio, to Columbus, and the Clinch Valley line of the Pocahontas division.

In accordance with its usual practice the railroad awarded cash prizes to the track foremen whose territories held first, second, third and fourth places on the different districts. Such prizes were awarded to 81 track foremen, including 21 first prizes, 24 second prizes, and 18 prizes each for third and fourth places.

Again this year the highest individual rating among section foremen was achieved by Ernal McCann, Sardinia, Ohio, whose territory, as in 1940, was given the highest possible rating of 9.50. This is the first time in the history of the railroad that the same man has received this rating twice. In fact, it has been achieved before by only one other section foreman. The second highest rating (9.49) for 1941 was attained by seven foremen, namely: L. W. Morris, Disputanta, Va.; C. W. Jamerson, Church Road, Va.; E. P. Wooten, Ford, Va.; L. C. Gooden, Island, Va.; J. H. Baldwin, Wilmore, W. Va.; J. H. Valentine, Franklin Furnace, Ohio; and G. C. Ridout, Winchester, Ohio. The greatest improvement to be made by any section foreman's territory during the year was achieved by that of C. M. Eller, Draper, Va., which gained 9 points to 9.27.

What Our Readers Think

MuchConstructiveWork Can Be Done in Winter

Greenville, Pa.

TO THE EDITOR:

I have been very much interested in the editorial in your December number, entitled "Maintenance—Must Go On During the Winter Months."

For a number of years, along with many others, we labored under the delusion that we had to close down maintenance work about December 1, or a little earlier, and stand by until about the first of April. For years we figured there would be heavy snows to handle and kept a force of reasonable size on each section, supplied with brooms and with plenty of coal in their tool houses. In those days, we made no definite effort to do any substantial amount of productive work during the winter.

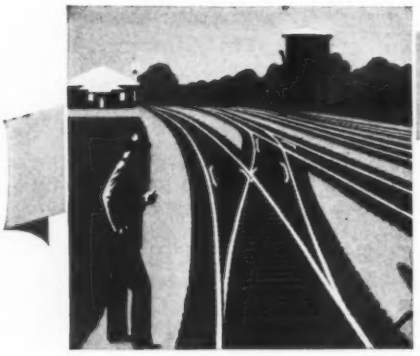
A number of years ago we awakened to the fact that a great deal of productive work could be done during the winter if we would double up our stand-by force, which, otherwise, did little while awaiting snow storms that seldom came. As a result, we changed our practice, which has produced very satisfactory results.

As a part of our campaign of education in the interest of effective winter work, we prepared graphs showing the low temperatures each day from November to March, in our territory, and, having this record before us, we were astonished to note the few days during which we have extreme temperatures. Our temperature graphs start with November, 1934, and cover three points on the line—Pittsburgh, Pa., at the south end of the road; Grove City, Pa., in the middle; and Conneaut, Ohio, at the north end. I thought you might be interested to know of the existence of such a record.

I might emphasize that most of us remember the extreme temperatures and are too prone to jump to the conclusion that these extremes are typical of the entire winter, when, as a matter of fact, they are generally isolated instances. Of course, I understand that in the Northwest and certain other territories, this condition does not prevail. In any event, as the result of our records, we now know that we formerly planned our work on a basis not in line with the facts, and it was most helpful to have this actual record of temperatures to lay down in front of our track supervisors and others, to convince them that we should change our practices—which we did.

F. R. LAYNG,
Chief Engineer, Bessemer & Lake Erie.

On the Bessemer & Lake Erie, Near Jamisonville, Pa.



WHAT'S the Answer?

Exchanging Old Tools for New

Where supply cars are not operated, is it practicable to require foremen to turn in old tools in exchange for new ones? If so, how is the exchange made? If not, why? What disposition should be made of the old tools?

Supervision Required

By H. R. CLARKE
Engineer Maintenance of Way, Chicago, Burlington & Quincy, Chicago

The only practical method of enforcing an exchange of old tools for new ones is by some method of direct exchange, and this is possible only where supply cars are operated, or some similar method is employed. Where supply cars are not operated, it is difficult to enforce an exchange unless we assume that each gang is supplied with more tools than are actually needed for the number of men being worked, so that tools can be shipped in for exchange when they wear out or are broken. Assuming such a situation, it might then be required that a waybill covering the shipment of the old tools be attached to the requisition for the new ones. Such a plan is not practicable, and certainly it is not desirable to carry a sufficient surplus of tools to permit this practice.

Where supply cars are not operated, the usual practice is to order such replacement tools as may be necessary, and often accompany the order with a statement that the items ordered are for replacement and that the old tools will be shipped in upon receipt of the new ones. Obviously, this is largely meaningless, as it is not practical to follow up the matter and make sure that this is done. Neither do I believe that this should be necessary, if proper attention is given to the approving of requisitions by division maintenance officers, and others whose approval may be required. In the case of a few tools, such as rail drills, rail benders and similar equipment, where there is only one on a section and where the cost of the tool is considerable, follow-up procedure to insure the return of the old tool is justified. However, with the general run of tools, such as shovels, spike mauls, etc., it is not. Certainly, tools that have been discarded for any reason, that is because they are worn out, broken or no longer needed, should be sent to the storehouse for such disposition as their condition justifies, that is, reissue, repair or scrapping.

Frequent inspection of tool houses and tool cars by maintenance officers, to determine the condition in which they are kept and the stocks on hand, should prevent the accumulation of any undesirable surplus of tools or material. It is only by such inspection that the stocks can be controlled.

Not Practicable

By L. H. DUVALL
Assistant General Storekeeper, Atlantic Coast Line, Wilmington, N.C.

Where supply cars are not operated, it is not practicable to require foremen to turn in old tools in exchange for new ones. It is the general practice for foremen to have central tool houses; the day's operations begin and end at the tool house, where the tools are kept under lock when not in use. These houses are inspected at intervals by officers having jurisdiction over the foremen, to determine the condition of the tools and whether new tools are required.

New or reconditioned tools are

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in March

1. Should bent track spikes be straightened by the section forces, or should they be sent to the stores department or reclamation plant to be straightened? Why?

2. Is asphalt suitable for floors subject to trucking or the handling of heavy materials? If not, why? If so, what are the advantages? How can the floors be repaired?

3. What disposition should be made of failed rails and those removed from the track because of observed defects? Does the weight of the rail or the character of the defect make any difference?

4. Is concrete cribbing suitable for headwalls for pipe culverts? If not, why? If so, what are the advantages?

5. What thickness of plank is most satisfactory for highway crossings? Why? Does the weight of the rail make any difference?

6. What effective method can be employed to prevent water columns from freezing during extremely low temperatures?

7. What precautions should be given particular attention when shimming heavy track? When removing shims? Why?

8. How should a new wood surface be prepared for painting? An old surface that has been painted? What details are important? What precautions should be observed?

shipped from the stores on properly approved requisitions. Obviously, the reason for the exchange is to get the old tools back. However, with proper supervision, the old tools can be recovered without exchange and they should be sent to the reclamation plant to be sorted and reconditioned.

Regardless of what system may be adopted to get the old tools to the reclamation plant, it will be necessary to rely on the human factor. All systems will get the same results if they are supervised properly. The exchange system has been practiced successfully because it keeps the matter before the men who are responsible for the tools, but it must be remembered that the foreman must get sufficient new or reconditioned tools to carry on his work properly, regardless of the old tools he turns in in exchange. If he is short an item or two, it will cause correspondence and the time required to handle it may be worth more than the scrap tools.

The question implies that where supply cars are operated, it is an easy matter to demand an exchange when issuing tools. Even in this case, however, the tools must be furnished, and the question of the shortage of old tools becomes a matter of correspondence. In trying to work out an exchange system, one runs into difficulty again by reason of gangs being increased or decreased. I would not care to recommend a practice where the expense of the operation is greater than the value of the results.

Cleaning Pipe Lines

What is the best method of cleaning pipe lines of hard scale? Of soft sludge? What precautions must be taken?

Several Methods

By G. M. Grime
Engineer of Water Service, Great Northern, St. Paul, Minn.

In general, the method to be employed for cleaning a pipe line will depend on the length of the line, the number of abrupt turns, the interval of time the line can be held out of service and the character of the incrustation. The cleaning of pipe lines usually becomes necessary by reason of incrustation caused by chemical reaction which takes place in the pipe line instead of at the treating plant, because the softening process could not be completed before the water was pumped through the pipe. This incrustation may be hard scale or soft sludge, depending on the chemical ingredients and the time it has been forming. In other cases, cleaning may be required to remove tuberculation caused by corrosion of the line or by the accumulation of mud, sand or other debris at low points in the grade line, thus restricting the normal flow of the water.

In the first case, the accumulation is usually calcium carbonate, which is readily soluble in muriatic acid. If the pipe line is comparatively short and has a number of right angle turns, acid cleaning may work out most advantageously. A temporary acid return-pipe line is usually laid between the ends of the portion of the pipe to be cleaned and, by means of a small pump, acid containing an inhibitor is circulated slowly through the line until the incrustation is dissolved. Results will be obtained most quickly where the sludge is soft, but hard incrustation is amenable to the same method, although at a slower rate. Dilute inhibited acid is usually employed for this purpose. It is well to have a chemist present to insure that the acid is handled in such a manner as to avoid personal injury, as well as to determine that the strength of the acid is maintained for the most effective dissolution of the sludge or scale.

Mechanical methods for cleaning pipe lines are usually most dependable, in that they give more certain results than acid cleaning. These methods range from the use of an auger, either turned by hand or by a small electric motor, to cleaners and brushes which are projected through the line by means of water pressure and to cleaners that are revolved at a high rate of speed and pushed through the line by means of a flexible shaft driven by a powerful motor.

Hand-cleaning methods will apply only in the vicinity of treating plants or other constricted places where lines are short. The use of cleaners and brushes which are driven through the line by means of water pressure will work out economically where high pressure can be made available, but in outlying places where the high pressure cannot be provided, they are not favored, as compared with the method where the cleaning tool is attached to a shaft and is, therefore, readily controlled independently of the water pressure.

In this case, the cleaners consist of hard steel lugs fastened by a chain to the revolving shaft. Only sufficient water is kept flowing through the line to carry the pulverized scale and sludge to the next opening, where the pipe line has been opened and where it can be pumped out of the hole. This type of cleaning can be carried through a distance of 2,400 ft., by working both directions from the opening in the pipe line. After the cleaner has passed through, the line will be practically as clean as when first laid. This method can also be applied for the removal of tubercles, mud and other debris. In any type or method of cleaning, the chief precaution to be observed is to plan the work so that the normal supply of water will be maintained while the work is being done, thus assuring that there will be no delay to traffic.

Covers a Wide Field

By J. P. Hanley
Water Service Inspector, Illinois Central, Chicago

This question covers a wide field, for it may include underground mains of considerable length, supplying both treated and untreated water, and the interior piping in power houses and other buildings, which convey raw and treated cold water, hot raw water and condensed hot water. Cleaning methods fall into two general classifications, namely, mechanical and chemical. The writer observed a case recently of the former method, in which 3,500 ft. of 6-in. and 2,100 ft. of 8-in. underground cast iron pipe was cleaned by a scraper dragged through the pipe by means of a hand-operated windlass, with the available water pressure utilized behind the scraper to assist the operation. The pipe was cleaned in sections from 1,000 to 1,500 ft. long. The incrustation removed averaged 3/32 in. in thickness and the flow capacity of the line was increased by about 50 per cent as a result of the cleaning.

This main carried untreated water and had been in service for about 24 years. If the water pressure had been sufficient to permit, the drag method would have been omitted and the full pressure method used, whereby the water pressure behind the cleaning machine forces it ahead without other mechanical assistance.

The chemical method consists of circulating a suitable acid or other cleaning liquid through the pipe for several hours. If the pipe to be cleaned is so long that the installation of a return line for the circulating pump is not desirable, the surge method may be used. In this case, the cleaning liquid is pumped into one end of the pipe that is to be cleaned and is received in vats at the other end. From these vats it is then pumped in the opposite direction, and the cycle is repeated as often as is necessary to clean the pipe. Where the chemical method is employed, the high points or summits on the line should be vented to permit the released gas to escape; otherwise, this method will not be fully effective.

Speaking generally, the mechanical method of cleaning is preferable where the pipe line to be cleaned is long and is of considerable diameter, while the chemical method is better adapted for relatively short or small lines that have the usual number of bends and valves. The chemical method is also better for cleaning traps, feed-water heaters, check valves and other accessories.

In deciding on the method to be used for cleaning a pipe line, the thickness, hardness and chemical composition of the scale to be removed should be studied. Sulphate, carbonate and silica scale each require different cleaning media, while iron rust and clay deposits call for something different from treating-plant scale.

A precaution to be followed in preventing scale deposits from treated water is to treat the water completely, so that all precipitation will occur in the treating plant. If this is not done, after-precipitation of a troublesome nature will occur in the filters and pipe lines after the water leaves the treating plant. The use of tannin or other inhibitor is often necessary in water-column lines and supply lines where water is treated by compounds. A precaution that might be taken where pipe lines carry untreated water from which clay, iron rust or other deposits are to be expected, is to provide blow-off valves at selected low points for flushing out the line. The installation of short sections of pipe is also desirable at points where it might be convenient to remove them for the insertion of a cleaning machine, if local conditions indicate that mechanical cleaning may be necessary at frequent intervals to maintain the carrying capacity of the pipe.

Bases for Estimating Costs

Is it practical to estimate the cost of new buildings on the cubical contents basis? If so, how should this method be applied for various types of buildings? If not, why? What other satisfactory methods can be employed?

It Is Practical

By A. L. Sparks
Architect, Missouri-Kansas-Texas, St. Louis, Mo.

It is practical to estimate the cost of new buildings on the cubic foot basis but to allow the answer to go at that would be misleading. One could estimate the cost of sugar, paper or tobacco, and scores of other articles by the cubic foot if he were informed sufficiently about these articles, yet it is probable that very few buyers would risk making their purchases on this basis. The reason for this is that the value of the cubic foot of sugar might depend on its moisture content, while that of a cubic foot of paper or tobacco might vary widely with the percentage of voids, that is, with how tightly they were packed.

In the same way, the cost of the building may depend on the volume of the voids in it; that is, it may depend on the arrangement of the rooms and the number of partitions that are to be erected. Again, the shapes of two buildings of identical gross volume have much to do with the difference in their costs. As an example, take two warehouses with concrete floors, brick walls and flat wood-roof construction, each of which contains 16,000 cu. ft. One of these buildings may be 10 ft. by 160 ft. by 10 ft., while the other is 40 ft. by 40 ft. by 10 ft. It will be noted that each of these structures has the same number of square feet of floor and roof, but that the first one has 3,400 sq. ft. of exterior brick wall, while the second one has only 1,600 sq. ft., or less than half, and that the brick work will be the expensive part of the building.

In figuring on two buildings of the same size and shape, to be erected on level ground having the same soil, and where labor and material costs are equal, there should be little difference in the cost of the two structures. Section tool houses, generally 12 ft. by 14 ft. in plan, are probably the most nearly standardized of all railway buildings, but they vary in cost because of differences in foundation conditions. Large multiple - story buildings, such as offices, warehouses and apartment houses can generally be figured on the cubic-foot basis more accurately than smaller buildings.

It is usually difficult for one estimator to figure by the cubic foot, using another estimator's cubic-foot price, since they may not cube the building in the same way. More accurate figures will be obtained by reducing the total known cost of a similar structure to a cubic-foot price and then computing the cost of the building to be estimated by the same cubing method.

One estimator may figure the height of the building from the bottom of the foundation to the tip of the roof; another may figure it from the underside of the first floor to the top of the walls; while still another may figure from a point midway between the first floor and the low point of the foundation to a point midway between the top of the wall and the tip of the roof. It will be seen that this leaves considerable room for discrepancies, but an accurate estimate is possible if we are sufficiently informed as to the method employed.

Personally, I have generally found it to be more satisfactory to break the estimate up to cover several principal units, such as foundations, floors, walls, ceilings, roof, etc., and then calculate the cost of each of these units on the basis of its respective cubic or square-foot price, then add to these amounts lump-sum prices for such special features as plumbing, heating, scales, elevators, etc. It should be kept in mind that accuracy in any method will depend largely on how definitely cost records are kept and partly on experience in applying previously determined costs.

Several Methods Used

By Frank R. Judd
Engineer of Buildings, Illinois Central, Chicago

It is practical to estimate the cost of new buildings on a cubical contents basis only in the event that accurate cost data are available for the type of structure under consideration, and it is desired only to determine its approximate cost. Several different methods are used in computing the volume to which the price per cubic foot is to be applied, but the one used more generally is to multiply the area in square feet by the average height of the building. This average height

is determined by measuring one-half the depth of the foundation walls below the first floor line, then adding the distance from floor to floor plus one-half the distance from the ceiling joists over the top floor to the apex of the roof.

A variation in the cubic-foot method is the preparation of estimates on a square-foot basis. Here again, the accuracy of the estimate will depend on the accuracy of the basic cost data with relation to the type of structure under consideration. In the event that detailed plans are available and there is sufficient time to do so, it is preferable to have a competent estimator or contractor draw off the quantities of labor and material involved and apply current prices, overhead expense, etc., in arriving at the total estimated cost of the building.

Lag Screws Versus Bolts

What are the relative advantages and disadvantages of lag screws and bolts for fastening outside guard rails on open-deck trestles? What diameter of hole should be used?

Uses Both

By G. A. Haggander
Assistant Chief Engineer, Chicago, Burlington & Quincy, Chicago

As a result of our experience in fastening outside guard rails, we use a ¾-in. bolt at the ends of each outside guard rail or fender, and ¾-in. by 10-in. lag screws in each intermediate tie. Formerly, we used lag screws for all the fastenings, but we found that there was a tendency for them to break loose. This difficulty has been eliminated by bolting each end of the guard rail.

We bore full sized ¾-in. holes for the ¾-in. bolts and lag screws, practically all before the timber is treated. We believe that this practice is satisfactory, as there is no tendency to split fenders by driving a bolt into a tight hole, and the holding power of the lag screws is needed only in the ties. We drill a ½-in. hole in the ties before the lag screws are turned in.

Save Material and Labor

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

It is our practice to use lag screws for attaching guard timbers to ties. The holes for these lag screws are bored through the guard timbers at the preframing plant with a ¾-in. auger or to the same diameter as the lag screws, but the holes for the lag screws in the ties are bored with a ⅝-in. auger. Guard timbers are 4-in. by 8-in. in cross section, and one lag screw is placed in each tie and is usually tightened by power ratchet wrenches. No boring in the field is necessary for application.

The primary purpose of the outside guard rails or guard timbers is to prevent the bunching of the ties and to keep a uniform tie spacing throughout the length of the trestle. Where light second-hand steel rails are used, they are attached to the ties by means of two bolts through the tie at each end of the rail and also at the quarter points. The remaining ties are fastened by means of ¾-in. by 5-in. lag screws. The reason for using the bolts is that because of the stiffness of the rail, the vibration of the trestle will soon loosen the lag screws and they will work out if the bolts are not used. On open-deck through trusses and on deck and through plate girders, the ¾-in. lag screws are also used, except that hook bolts are applied on every fourth tie to hold the track in line on tangents; on curves the hook bolts are applied on alternate ties.

The advantages of using lag screws on outside guard timbers is the saving of at least 25 per cent in labor and material. Again, where 9-ft. ties are in service on trestles having four-ply chords, the standard spacing of guard timbers from the rail does not permit the use of bolts, as the guard timber or one edge of it is placed directly over the stringer. Holes bored in the guard timbers should not be larger than the bolts or lag screws for which they are intended. In other words, they should fit tight; otherwise they exhibit a tendency to come loose and work out.

Are Longer Rails Desirable?

Are rails longer than 39 ft. desirable? Why? Are there limitations? If so, what?

Reduce Joint Maintenance

By E. M. Hastings
Chief Engineer, Richmond, Fredericksburg & Potomac, Richmond, Va.

This subject has been under discussion in the Rail committee of the A.R.E.A. for many years and reports appear in the Proceedings from 1934 to date. In the latter part of 1938, a tabulation indicated that about 69 per cent of the mileage reporting to the Rail committee favored a rail longer than 39 ft. A. N. Reece, chief engineer, Kansas City Southern, prepared a comprehensive statement of the comparative benefits of 112-and 131-lb. rail in 39-ft. lengths, compared with 45 and 78 ft. From these studies it would appear that technically a rail longer than 39 ft. is desirable. It seems unnecessary to present these data as they are of record for any who may wish to study the question.

European railways are using rails much longer than the present American standards, ranging up to 98 ft. in Germany, but I have seen no recent records of the performance of rails on the European roads. If such information could be secured at this time, it might show that some difficulty had been encountered in replacement or restoration made necessary by bombing raids on railway property. These difficulties may be severe, because of the additional labor or equipment needed to handle the longer rails quickly in an emergency, particularly in England where the rail lengths run up to 90 ft.

A number of reasons might be given why rail longer than 39 ft. would be desirable. I think that the most pertinent one would be the reduction in the number of joints, thereby reducing materially the difficulties and expense of joint maintenance.

What are the limitations? Unless the steel mills can equip themselves to handle rails longer than 39 ft. without added cost per ton, and unless experience of the future will show that we have approached more nearly the ultimate goal in rolling and handling rail at the mills by the elimination of interior defects, there will be very definite obstacles to the adoption of a standard length in excess of the present 39 ft. My own view is that we do not yet have the assurance that

rail manufacture has become so nearly perfect that we approach the ultimate elimination of the shatter crack, which produces the interior fissure, to justify us in going to a longer rail, even if it could be secured at the same mill price per ton as the 39-ft. rail. The difficulty of transportation also limits the rail length, unless it be in multiples of approximate car lengths, namely 39 ft., 78 ft., etc.

There is another limitation which I have not heard discussed extensively, namely, the laying of rail in lengths greater than 39 ft. A 39-ft. rail is about the economic limit that can be handled by manual labor, that is, without the use of a crane. The use of power machines for the handling of rail when it is being laid is undoubtedly the most economical and efficient method, since it reduces the use of hand labor as much as possible. There are sections of certain roads, however, where traffic is so dense that where only two tracks are in existence, it is not economically practical to take traffic off of one track for the period necessary to utilize to advantage work equipment for the laying of the rail. Such conditions made the use of 39-ft. rails the most satisfactory from all standpoints.

Another question that has not been discussed extensively is the renewal of defective rails. If we had 78-ft. rails or longer, the renewal of a broken rail would require the assembling of two or three section gangs to make the replacement, with possible delay to traffic or the getting of a unit of work equipment to handle the longer rail, which would also cause serious delay to trains. For these reasons, I believe that the questions that arise in connection with the possible use of rails longer than 39 ft. have not all been answered as yet, to the extent that a general adoption of longer rails can be justified. I hope that the future holds satisfactory answers and full assurance that we can secure rails so free from the possibility of failure that the greater lengths may be used safely and economically.

Make Smoother Track

By George M. O'Rourke
Assistant Engineer Maintenance of Way, Illinois Central, Chicago

It would be advantageous to have rails longer than 39 ft. This would call for fewer joint bars and fewer track bolts and spring washers. There would be a reduction in the number of pieces to handle and place in the track, and in the number of joints to be maintained. Longer rails would produce smoother and more comfortable-riding track. I favor the 78-ft. length, as one rail would replace two now in the track and, since the cars available will now handle 39-ft. rails as a single load, 78-ft. rails will more nearly utilize the equipment for two-car loading.

The greatest disadvantage will be the probable increased cost of the rail, and the question for consideration is whether this increase in cost will offset the savings that will be realized. To produce rails longer than 39 ft. economically, the manufacturers will need to rearrange their mill equipment for rolling longer rail. This will include hot beds, straightening machines, saws and drill presses. Obviously, the cost of making these changes will be paid ultimately by the users of rail. Again, other difficulties that may result from the use of longer rails include the handling of the rail on cars, since it would be necessary to ship most of this rail on flat cars, and this would necessitate the construction of more flat cars to avoid an extreme shortage of this equipment while handling rail. Not a few roads would find it necessary to purchase new rail cranes to handle the longer and heavier rails, for the present cranes may not have booms long enough to care for the increased length of the rail.

Some difficulty may be experienced in the renewal of failed rails, since section gangs are small. It is believed by some, however, that this difficulty can be overcome by applying a pair of angle bars at the point of breakage until sufficient men can be assembled to change out the rail.

Applying Tinted Paints

What precautions should be observed when applying tinted paints to interior wall surfaces? Why?

Must Be Clean

By A. T. Hawk
Engineer Architect, Chicago, Rock Island & Pacific, Chicago

Surface preparation is one of the essentials of the successful application of tinted paints and some experienced painters say that proper preparation of the surface accounts for as much as 80 per cent of the success of any job. If the surface is not clean and free from dust, grease or other similar substances, one cannot expect to obtain satisfactory results. It is necessary also to remove all loose and scaling paint and plaster, and to fill any cracks that may be in the plaster.

One should never paint over fresh plaster or plaster that has not aged, with any paint, but this is specially important with tinted paints. However, fresh plaster can be aged artifically by washing it with a solution of zinc sulphate to neutralize the free alkali contained in the plaster. Walls that have been painted should be washed well with an appropriate cleaner and then rinsed thoroughly with clear water.

In selecting the paint, one should choose for the sheen desired, either a flat, a semi-gloss or a gloss paint, depending on the character of the room. Select a color, if possible, which will cover in one coat. Bath and toilet rooms should be given a glossy coat, while the treatment of other rooms will depend on whether light reflection is desired. It is desirable to use warm tints on north walls and others that receive little light and cold colors on those that receive direct sunlight.

Dark tints sometimes give an impression of fading, particularly if the old paint was porous, in which event a primer should be used to cover the old coat. Some colors have a tendency to fade when exposed to direct sunlight, and this should be given consideration when selecting the paint. Again, some paints take too much tinting and produce shimmering.

First, Make Inspection

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Before interior paint is applied, a close and careful inspection of the surface should be made to determine its condition. An old hard-finish plaster surface often has a number of fine cracks that develop while it is drying out. In office buildings one usually finds dark greasy or sooty spots on the walls, which must be cleaned thoroughly before any attempt is made to apply paint. Small hair cracks can be overcome by applying a coat of sizing which acts as a filler and prevents absorption of the oil from the paint. In all cases, plaster walls should be rubbed down with fine sand paper after they have been

cleaned, to remove any loose particles, but care should be exercised not to scratch or roughen the surface.

If tinted paint is to be applied over a wood surface, it is also important that it be cleaned thoroughly by washing and rinsing. If varnish has been used on the walls, and the door and window casings, it should be removed. If a flat coat of tinted paint is to be applied over a previous glossy coat, the latter should be roughened with fine steel wool or sand paper.

My own experience has taught me that the most important precaution to be observed when applying interior paints is to know that the walls are thoroughly clean and that they have a uniform, smooth surface. Then the next most important factor is to prepare the tinted colors with a good quality of white lead. These colors can be obtained from local paint dealers in cans of various sizes. In selecting the colors, one should know that the brand he is offered is reliable, that it will hold its color and that it will mix without streaking. It is also important always to use special care in mixing, as the colors are quite strong and only a small amount is neeed to tint a gallon of white lead mixed in oil. For this reason, color should always be added in small amounts and mixed thoroughly before more is added.

Distributing Ties for Renewal

Should ties be distributed by train at the point of use or should they be set out in cars at stations and later distributed by motor car and trailer? Why? What are the advantages? Does the time of receipt make any difference?

Unload at Stations

By Nels J. Larsen
Roadmaster's Clerk, Chicago & North Western, Antigo, Wis.

Ties should be unloaded at stations immediately upon arrival and distributed later by motor car and trailer. First of all, distribution of ties by train involves work-train expense and, in most cases, it also involves several days delay in releasing the cars, now badly needed for other loading. Aside from this, when ties are unloaded by train, they are usually dumped off the cars as the train moves along slowly. This means that ties go sliding down embankment slopes and into ditches, and this involves additional labor to pick them up and place them where they will be used.

In nearly all cases where ties are unloaded in this manner, the section gang must pick them up and either carry or haul them to the point of use. For these reasons, there is no advantage in unloading ties from cars by train, with the possible exception of stretches where an unusual number of new ties are needed for renewal, or where new tracks are being constructed.

By unloading the ties at stations for later distribution by motor car, cars can be released at once for revenue loading, and the distribution can be made when the section gangs are not too busy with other important work. In this way they will have their ties at the point of use when the time comes to make the renewals, and this will eliminate the extra time and effort required if they are dumped off the cars by a work train and then moved to the point of use.

Obviously, the time of receipt may make some difference in certain localities. In our territory, we usually receive our tie allotment for the next year during the late summer or early fall, in which case they must be stacked in piles and protected from fire. Yet, even if the ties were received while the renewal work was under way, there would still be no advantage in unloading from a work train, because of the cost of the work-train service and the disadvantage of having the ties scattered, and of having to pick them up and redistribute them prior to insertion in the track. Taken all in all, I believe that the cheapest and most effective method to be employed for distributing ties for renewal is to unload them at stations immediately upon receipt, and then truck them to the point of use.

Do It by Train

By J. C. Patterson
Chief Engineer Maintenance of Way, Erie, Cleveland, Ohio

Ties should be distributed by train to the point of use but only after actual requirements have been ascertained. The preservative treatment of ties permits the use of this system. When untreated ties were used, they had to be distributed as received, which made it necessary to place them in piles and protect them with a covering of earth, with later distribution from these piles by push car when they were to be applied. With this system distribution was often faulty, and some times ties remained unapplied for several years, and in some instances they would have to be picked up and moved to other points.

With ties assembled at a treating plant, if the ties come due for treatment at a time they are not required for use, they can be stored in the seasoning yard and shipped out as they are needed. Under this method, ties can be ordered from the treating plant as they are wanted after requirements have been ascertained by the spring spotting. Considerable saving is effected by avoiding the expensive piling, protection and distribution by the foreman and his section gang.

Release Cars Quickly

By L. A. Rape
Section Foreman, Baltimore & Ohio, Crothers, Pa.

Probably no one thing connected with railway operation is being emphasized more strongly today than the necessity for the immediate release of cars containing company material. While ties are generally shipped in non-revenue cars or cars which are not being used intensively because they are designed for the movement of seasonal commodities, these cars should still be released as quickly as revenue cars, so that they can be sent back for reloading and thus save the use of a badly needed revenue car.

If a work train, or the services of a local freight, can be obtained to unload the ties immediately upon their receipt, then by all means they should be unloaded at the point of use, regardless of the time of year. If they come outside of the working season they can be stacked or placed in lots of three or six in pyramid-shaped piles, parallel with the track and at a safe distance from it. If all piles are at the same distance from the track the appearance will be much better.

If a work train, a local freight or a yard engine is not available for a day or two, the car or cars should be spotted where the ties can be unloaded and stacked in storage piles of 80 to 100 ties. They can later be taken from these piles and distributed by motor car and trailer. This, however, is only the "next best" way, which involves some hazard on any

line and considerable on a busy main line, as well as that connected with the rehandling of the ties.

Prefers a Work Train

By W. H. King
Section Foreman, Missouri Pacific Lines, Francitas, Tex.

Ties should be unloaded by train as near the point of use as practicable. Where they are to be inserted by extra gangs, they should be scattered along the track where they are to be used, but for section gangs they should be unloaded at the places where the ties are worst and then stacked until they are wanted. Only a few ties should be unloaded at stations, aside from those that are to be used within the station limits. Any place they may be piled is likely to be blocked by cars that have been set out for loading or unloading, just at the time when they are wanted. In such cases it may be necessary to carry them from one to several car lengths to load them on the trailer.

In general, ties will be kept in better condition if they are out on the line where the gangs do not have to go so far for them.

When spotting ties we often find one or two bad ties that should be replaced, and this would be done if the new ties were conveniently at hand, but if they are at a station several miles away, the failed or failing ties will have to be left in, since it will consume too much time to go in after them. By unloading out on the line, ties will be watched more closely, so that they can be unloaded exactly at the point of use. The ties should be shipped as they are needed, and this time will vary, depending on the section of the country in which they are to be used.

How to Overcome Kinking

What causes kinking at the heel of the switch? How can it be overcome?

Creeping Rail Does It

By W. Woolsey
Section Foreman, Illinois Central, Chicago

The principal cause of kinking at the heel of the switch point is rail creepage. The filler block which is interposed between the running rail and the turnout rail at the heel of the switch, is held in place by four bolts which extend through the inside joint bar and the web of the main-track rail. Because of this form of assembly, this joint is firmer and more rigid than any others in either the turnout or the running track. Yet it offers practically no resistance to longitudinal movement when the main-track rail creeps. When this rail does creep it places a heavy torsional stress in the entire joint assembly, and as locomotives and cars make the turnout movement, there is a tendency toward readjustment to relieve this stress, with kinking of the joint as the direct result. In this connection, it will be noted that this kink is always outward with respect to the turnout curve.

To overcome the trouble, the main-track rail should be anchored firmly with an ample number of anti-creepers to insure that there will be no movement in creepage. The anti-creepers should be placed both ahead and behind the turnout for a sufficient distance to prevent both crowding and pulling forces from acting on the joint. If the rail has run at all it should be driven back before the anti-creepers are applied.

Keep Points Free

By L. A. Rape
Section Foreman, Baltimore & Ohio, Crothers, Pa.

Before bolted heel blocks came into use at the heel of the switch points, kinking at this joint was unknown. This, then, gives the clue to the basic cause of kinking at the heel of the points. At that time the stock and through rails were free to run independent of the switch points and the turnout rails. A little observation will disclose that this form of kinking is caused by the main-track and turnout rails pushing or pulling in opposite directions and is more pronounced at the heel of the point because the turnout rails are at an angle to those in the main track. With the present construction, in which the heel block is bolted through both the point and the running rail, the only way to prevent kinking is to keep the main-track rails from creeping.

This can be accomplished only by the application of enough anti-creepers to prevent movement in either direction. They should be used liberally; it will be better to apply too many than not enough. If the rail has already crept, it should be driven back until it has the correct amount of expansion before the anti-creepers are applied. Again, if they are to be fully effective, the cribs must be filled with ballast. Rail creepage should be so controlled that no strain resulting from longitudinal movement of the rail will be applied to the points, and this requirement demands that the anti-creepers must extend a long distance each way from the turnout.

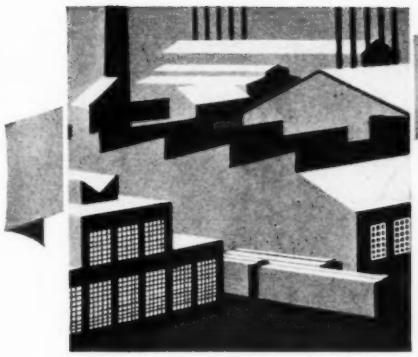
Good Gage Essential

By M. J. Hanna
General Foreman, Track and Labor Department, Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

Correct line and gage through turnouts, particularly those through which high-speed movements are made, are essential. In too many cases this requirement is not fulfilled, because enough care is not exercised when the turnout is installed or when it is overhauled. A turnout contains many parts, some of which are made to a high degree of precision, and all of which must fit according to the dimensions of the spreads back of the heel of the switch points, and to a point beyond the frog where the turnout clears the running or through track.

When a kink appears at the heel of the switch point, it is usually evidence that the gage is tight. This is a sure sign that an error has been made in the bending of the stock rail, thus preventing a correct fit of the point. Where the stock rail has been bent correctly and the exact spread at the heel is preserved, the foreman should have no difficulty in lining the rails on the through route or main line, before the turnout rails are placed in correct position and spiked to gage. Where cast filler blocks are not used at the heel of the switches, but only track spikes are employed to hold the rail and points in place, the foreman should make sure that the heel spread of the point has been spiked to exact measurement, for at this point and at the frog point are two dimensions in which no variation should be allowed to exist.

Rail creepage will also cause kinks and tight gage at the heel of the switch points, just as it does at the point of the frog. When kinks or tight gage appear at either of these points, the entire turnout will need adjustment and the liberal application of anti-creepers.



PRODUCTS of Manufacturers

Hand-I-Air Portable Compressor

A NEW light-weight portable two-wheeled compressor, known as the Hand-I-Air compressor, which is designed especially for tie-tamping and other applications in railroad maintenance work, has been developed by the Worthington Pump & Machinery Corporation, Holyoke Compressor and Air Tool department, Holyoke, Mass. Having a capacity of 60 cu. ft. of free air per minute, the new unit will operate as many as four tie tampers at a time or an equivalent number of other types of track and bridge and building tools. For ready portability, it is mounted on two pneumatic-tired wheels and is provided with a push handle at each end.

The new unit consists of a two-stage air compressor driven by a four-cylinder Hercules gasoline engine. In the compressor there is a low-pressure cylinder with a diameter of 6 in., and a high-pressure cylinder with a diameter of 3½ in., the stroke being 4 in. In the engine, the cylinders have a diameter of 3¼ in. and a stroke of 4 in., while the speed of the engine under full load is 1,200 r.p.m. In dimensions, the unit is 3 ft. 4 in. wide,

Hand-I-Air Portable Compressor

4 ft. 3 in. high, including the muffler, and 5 ft. 6 in. long, exclusive of the push bars. It weighs 1,200 lbs.

Other features of the new compressor include two-stage air cooling, feather valves, force-feed lubrication, sealed crank case, formed-steel welded frame, and roller bearing wheels.

Whiteprint Machine

THE Ozalid Products division of the General Aniline & Film Corporation, Johnson City, New York, has introduced a new printing unit, known as the Model "C" Whiteprint machine, which is said to produce prints at speeds up to 12½ ft. per min. The new machine is synchronized to print and develop Ozalid sensitized materials in one continuous operation, and is capable of using cut sheets as well as continuous yardage. It accommodates materials up to 48 in. in width and is constructed for either front or rear delivery of the prints.

The new machine incorporates an automatic device for separating the sensitized material from the original. After printing, the original is delivered to the operator in a receiving tray, and the printed material is carried through the developer and deposited into a delivery tray in front of the machine, or on a sorting table at the rear of the unit as desired by the operator. Another feature of the machine is a blower which removes hot air from the printing cylinder, cools the burner and creates the vacuum necessary for the automatic separating device. It is said that cooling takes place evenly, thereby producing uniform light distribution and insuring long life for the high-pressure mercury vapor lamp. A slight vacuum inside the machine is said to prevent the leakage of ammonia fumes to the outside.

Variation of the light intensity without changing the printing speed is made possible by an adjustable burner shade, which is said to be especially useful when running long prints of varying capacity. A special transformer permits the machine to be adjusted for line voltage. For assuring correct voltage adjustment, a terminal board is provided on the transformer, which is equipped with taps permitting the machine to be adjusted at 5-volt intervals for line

The New Ozalid Model "C" Whiteprint Machine

voltages from 205 to 235. This machine is shipped in one complete unit and it is said that it requires only 19 sq. ft. of floor space.

Model 144 Malldrill

A NEW heavy-duty ¼-in. electric Malldrill, designated as Model 144, has been developed by the Mall Tool Company, Chicago, which is light in weight and adapted particularly for heavy-duty high-speed drilling and for drilling in close quarters. The drill consists of a universal motor for either 115 volt or 230 volt direct current or 60-cycle alternating current. Alloy steel, accurately hobbed and heat treated gears drive the ¼-in. three-jawed heavy-duty geared-type chuck. A die-cast aluminum housing encloses the drill and

handle. The drill is controlled by a two-pole, automatic switch with a locking device for continuous operation.

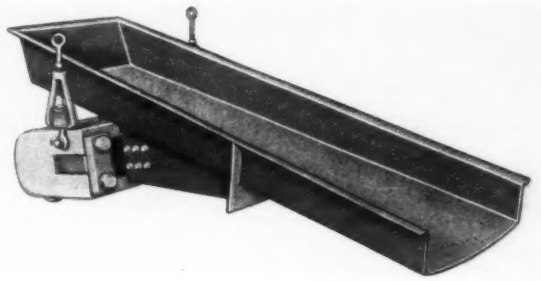
The drill has an overall length of 8½ in. and an overall height of 7½ in. It has a net weight without the conductor cord of 4½ lb. and a no-load speed of 4,000 r.p.m. Motor ventilation is provided by a built-in pressed steel centrifugal fan, screened intake holes and screened or otherwise protected exhaust holes. All rotating parts are mounted on sealed precision ball bearings. The drill has no projecting points or screw heads and easy access is provided for repairs, inspection or adjustment of the switch and the motor brushes and commutator. It is said that this new drill, although

The Model 144, ¼-In. Heavy-Duty High-Speed Malldrill

very light in weight, has about twice the power of similar drills, and is built to stand heavy-duty operation.

New Syntron Vibratory Feeders

THE Syntron Company, Homer City, Pa., has added two heavy-tonnage models of electromagnetic Vibra-Flow feeder conveyors to its line of such equipment, of which the Model F-4 will handle up to 100 tons per hour and the Model F-5 up to 500 tons per hour of material such as crushed rock. The feeders consist of a ruggedly constructed trough to which the high-speed vibrating element, a heavy electromagnet, is attached. The electromagnet is energized by a rectifier tube which is controlled by a rheostat, thus providing finger-tip control of the volume output of the feeder, from capacity down to a slow dribble. Special troughs can be used for special work and the vibrating element may be mounted under the trough at the back or above the trough at the discharge end. The troughs and vibrating unit are supplied with vibration absorbers for suspension by cables from above or for floor mounting on a solid or rigid foundation. The F-4 feeder carries feeder pans as wide as 30 in. and as long as 60 in., while the model F-5 can be equipped with troughs as wide as 48 in. and from 60 in. to 96 in. long.

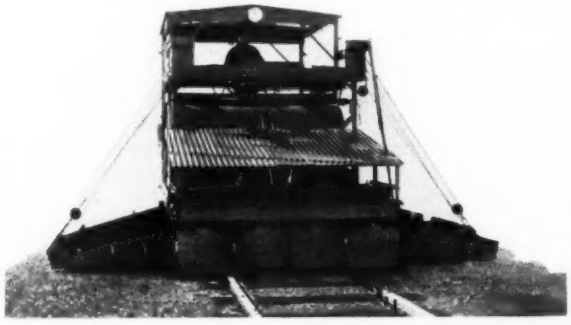


One of the New Syntron Vibra-Flow Feeder Conveyors

New Fairmont Oven-Type Weed Burner

A NEW, oven-type weed burner, M27-series G, has been designed by Fairmont Railway Motors, Inc., Fairmont, Minn., to provide increased effectiveness and economy in weed destruction. The oven plates on this burner have been raised to provide a larger burning chamber and improved combustion. It is equipped with hinged side wings, which, when lowered, provide what amounts to two more ovens, since the side plates keep the heat in and prevent side winds from blowing the flame around. With the wings lowered, the M27-series G burns a swath 18 ft. wide.

The burner is said to be easy to operate and control. The wings have spring counterbalances, which make them easy to raise or lower. When they are adjusted to the right position, they may be locked in place by means of a rachet and pawl. The flame can be adjusted by easily-controlled burner nozzles. The burner is propelled by a 72-h.p. engine. It has directional gear, front wheel drive, a four-speed heavy-duty truck-type transmission and four-wheel vacuum brakes.



The New M27 Series G Weed Burner Burns a Swath 18-ft. Wide

Williams' Superrenches In Structural Box Pattern

J. H. Williams & Co., New York, has recently added a structural box pattern type of wrench to its line of chrome-molybdenum Superrenches. The box pattern type wrenches have

A Structural Box Pattern Superrench

a 12-point box head and an offset tapered handle. They are forged from chrome-molybdenum steel, heat-treated and finished in baked gray enamel. The new wrenches are designed to provide greater safety in structural work. The box head insures a firm hold on the nut and the offset handle provides working clearance. The tapered handle is said to be the type preferred by steel workers for lining up bolt holes. These wrenches are available in six sizes, with openings ranging from 1-7/16 in. to 2⅜ in., accommodating U. S. standard nuts from ⅞ in. to 1½ in.

NEWS of the Month

West Coast Roads "Black Out" Switch and Signal Lights

Since the outbreak of the war in the Pacific, railroads on the West coast have been busy providing black-out protection for all switch and signal lights. This protection has been completed in the terminal areas and in many cases on all main lines. In general, the lights have been protected by hoods and by painting a portion of the lens or reflectors or both to prevent rays from being directed upward so that they might be visible to aircraft. The practice of reducing voltage at night on color-light signals has also been used. In placing hoods on switch lights on the Southern Pacific, the former short hood is replaced with a longer hood which projects 4¾ in. from the lens and slightly below the center of the lens on each side. These shields are made of 24 or 26 gage sheet metal, painted black.

Wage Dispute Settled— Rails Ask for Rate Increases

Settlement of the wage controversy under a mediation agreement was finally accomplished by the President's Emergency Board on December 2, after the board was reconvened by the President under the threat of a nation-wide rail strike. The final basic-pay increases agreed upon will amount to approximately $312,000,000 annually for Class I roads, as compared to the $265,000,000 recommended in the original report of the Emergency Board. On December 13 the railroads filed an application with the Interstate Commerce Commission to increase freight and passenger rates approximately 10 per cent except on coal, coke and iron ore. The increases in rates are expected to produce about $357,000,000 additional revenue annually and offset the wage increases and higher material costs. The hearings on the rate increases will begin on January 5 and will be completed as quickly as possible.

On Class I roads, under the provisions of the new wage agreement affecting maintenance of way employees, all hourly, daily, weekly, monthly and piece-work rates of the employees represented by the 14 non-operating brotherhoods will be increased 10 cents an hour, effective December 1. A minimum rate of 46 cents per hour is established and all other rates of pay after the increases have been applied will be adjusted whenever necessary to this minimum. The vacation award provides that, effective with the calendar year 1942, an annual vacation of six consecutive work days with pay will be granted to each non-operating employee who renders compensated service on not less than 160 days during the preceding calendar year.

Eastman Appointed Head of Defense Transportation

On December 23, President Roosevelt made public an executive order establishing the Office of Defense Transportation and announced that he had appointed Joseph B. Eastman, chairman of the Interstate Commerce Commission to be its director. The new office, like other defense agencies, is created in the Office for Emergency Management of the Executive Office of the President and supersedes the Transportation division of the Advisory Commission to the Council of National Defense, which has been headed by Ralph Budd, president of the Chicago, Burlington & Quincy. Following the announcement of his appointment, Mr. Eastman expressed the hope that Mr. Budd would join the new organization.

The Office of Defense Transportation, ODT, will have four divisions—Railway Transport, Motor Transport, Inland Waterway Transport, and Coastwise and Intercoastal Transport and such other divisions as the director may determine. Appointments of division heads by the director are to be approved by the President. ODT is given broad powers, among others, to coordinate transportation policies and activities of federal agencies and private groups; to keep abreast of wartime transport requirements; to coordinate and direct domestic traffic movements; to exercise emergency powers given the President in the Interstate Commerce Act; and to advise on emergency legislation for domestic transportation.

Railways Meet With OPM To Select An Advisory Committee

On December 12 more than 200 representatives of the railways and the railway equipment and supply industry met with representatives of the Office of Production Management to consider the demands that will be placed upon them as the result of the United States' involvement in the war, and to set up a permanent advisory committee to work closely with the government agencies.

The meeting, which was conducted by Andrew Stevenson, active chief of the Transportation, Automotive and Farm Equipment branch of OPM, was also attended by William S. Knudsen, director general, OPM; Donald M. Nelson, executive director of the Supply, Priorities and Allocations Board, and also director of the Priorities division, OPM; W. L. Batt, director, Division of Materials, OPM; Joseph B. Eastman, chairman of the Interstate Commerce Commission; and Ralph Budd, transportation commissioner of the Advisory Commisson to the Council of National Defense.

Following brief general remarks by Messrs. Knudsen, Nelson and Batt, all of whom stressed the importance of the organization of the Transportation Industry committee for the purpose of rendering advice on transportation matters when called upon by the OPM, it was pointed out that the OPM is now asking the railway industry to nominate a permanent committee of approximately 20, including nine members representing the railways (seven for the Class I railways, one for the Short lines, and one for the Terminal companies), two representing the locomotive builders, four representing the car builders, and the balance representing the appliance group.

At the meeting, Ralph Budd reviewed the railroad situation and stated that the policy of maintaining our present railroad plant must be carried through without curtailment or interruption. Mr. Budd said that our policy, from the beginning has been to use as small an amount of materials as transportation can get along with.

Following Mr. Budd, Joseph B. Eastman, chairman of the Interstate Commerce Commission, emphasized that adequate maintenance is essential to efficient railroad service, and that is essential to national defense. The problem is to determine the amount and character of material which will be necessary for adequate and frugal maintenance. The railroads are put on their honor to submit conservative estimates.

Mr. Eastman said also that there will be need for all possible improvement in operation, in addition to the new equipment proposed by the railroads. If the railroads, he continued, find themselves unable to do all that is necessary, embargo and priority orders can be enforced by the Interstate Commerce Commission, but this practice should be avoided because the results might be demoralizing if normal commercial and industrial pursuits are interrupted.

Association News

Track Supply Association

President R. M. Blackburn has appointed chairmen of committees to head activities preparatory to the exhibit to be held next September as follows: Publicity, H. W. Cutshall (Electric Tamper & Equipment Co.); Membership, T. D. Crowley (Creepcheck Co., Inc.); Hotel, H. C. Hickey (Rail Joint Company); Entertainment, C. O. Jenista (Barco Manufacturing Company).

Metropolitan Maintenance of Way Club

With 150 members and guests in attendance, the last meeting of the club was held at noon on December 11 at the Hotel Governor Clinton, New York. Following luncheon, the club was addressed by Walter D. Binger, commissioner of borough works of New York City, and chairman of the National Technological Civil Protection committee. Mr. Binger recently spent several weeks in England in the latter capacity, investigating various aspects of the problem of civilian defense. In his address before the club he described the effects of bombing raids on English railroads and told of the methods and organization that are employed by these roads in repairing bomb damage.

Maintenance of Way Club of Chicago

The last meeting of the club, held on December 15 in the Ambassador room of Huyler's restaurant, in the Straus building, Chicago, assumed the aspect of a debate on the relative merits of making tie renewals with section forces and extra or specialized gangs. Before a group of 156 members and guests, F. E. Schaumburg, roadmaster, Chicago & North Western, upheld renewals by the section forces, presenting many convincing arguments in favor of this method, while R. J. O'Connor, roadmaster, Chicago, Milwaukee, St. Paul & Pacific, presented equally strong arguments for doing this class of work with specialized gangs.

The next meeting of the club, which will be held on January 26, will present a symposium on Maintenance in War Time, with three speakers presenting the viewpoints of railway managements, the chief maintenance officer and the roadmaster.

Bridge and Building Association

Members of the Executive committee met in Chicago on December 1 with President R. E. Dove, Vice-Presidents F. H. Soothill and Neal D. Howard, Secretary A. G. Shaver, Treasurer F. E. Weise, Directors R. E. Caudle, I. A. Moore, M. Meyer and J. L. Varker, and Past Presidents H. M. Church, A. E. Bechtelheimer and Elmer T. Howson present.

Consideration was given to the status of delinquent members and measures adopted designed to clear up these delinquencies. Six applicants were elected to membership. The report of a committee appointed to prepare an index of the Proceedings of recent years was approved and arrangements made to include this index with the Proceedings of the 1941 convention, The committee then reviewed the list of members who volunteered for committee service and made tentative appointments to the committees to study and report on the subjects selected for consideration at the next convention.

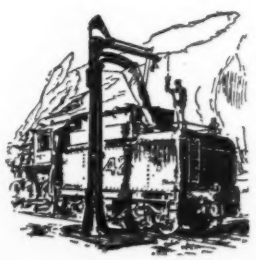
Roadmasters' Association

Members of the Executive committee met in Chicago on December 8, with President A. B. Hillman, Vice-Presidents E. L. Banion and H. E. Kirby, Secretary F. O. Whiteman and Executive Committee members E. J. Brown and F. J. Meyer present. After viewing the financial and membership status, nine applicants were elected to membership. The committee then approved the recommendation of the Arrangements committee that the Stevens Hotel again be selected as headquarters for the 1942 convention. The committee also approved the recommendation of a special committee that the next issue of the Proceedings be presented in a new format but with the same page size.

The Executive committee then appointed A. G. Shaver, secretary of the association, effective January 1, 1942, to succeed F. O. Whiteman, who submitted his resignation last September, effective at the convenience of the association. The committee then spent the remainder of the day selecting the personnel of the committees that are to report on subjects selected at the last annual meeting.

Wood-Preservers' Association

The program has now been completed for the thirty-eighth annual convention which will be held at the Hotel Nicollet, Minneapolis, Minn., on January 27-29. In addition to numerous reports and papers dealing with the improvements in the technic of treating timber for railway and other uses, several papers will be presented at the User's Day session on Wednesday forenoon that will be of special interest to railway officers. These features include an address by B. Blum, chief engineer of the Northern Pacific, on that railway's experience in the use of treated timber; a paper by W. A. Summerhays of the purchasing department of the Illinois Central, and recently consultant on timber purchases with the Federal Office of Production Management at Washington, D.C., on War-Time Conditions in the Wood Preserving Industry, and another paper by W. J. Burton, assistant to chief engineer, Missouri Pacific, on the Treatment of Gum Ties.



Members from New York, Philadelphia, Washington and Pittsburgh will travel to Chicago on special cars leaving New York on the Pennsylvania's Red Arrow train, at 4:55 Sunday afternoon, January 25. From Chicago, the C.M.St.P. & P. will operate a special train to Minneapolis, leaving Chicago at 10 o'clock on Monday morning, January 26, and stopping for two hours at the Forest Products Laboratory, Madison, Wis., where opportunity will be afforded to confer on possibilities for the increased use of timber in substitution for steel and other materials during the present emergency. The train will arrive at Minneapolis, Minn., at 8:55 o'clock that evening.

American Railway Engineering Association

During the latter part of December, Bulletin No. 428 was mailed to members, this bulletin including the reports of seven standing committees to be presented at the annual convention in March, as follows: Uniform General Contract Forms; Buildings; Yards and Terminals; Highways; Cooperative Relations with Universities; Maintenance of Way Work Equipment; and Economics of Railway Labor. Bulletin No. 429, which is now in the hands of the printer and which will be mailed to members during January, will include the reports of the committees on Wood Bridges and Trestles, Masonry, Iron and Steel Structures, Impact, Waterproofing of Railway Structures, and Records and Accounts.

During December, appropriations authorized by the Association of American Railroads for carrying on during 1942 the work of certain A.R.E.A. committees making special investigations or studies, were authorized as follows: Transverse fissure investigation, $9,000; rail failure statistics, $5,832; service tests of joint bars, $2,500; rolling-load tests of joint bars, $5,000; tests of manganese frogs, $1,000; waterproofing tests of asphalt and pitch, $750; boiler feed water studies, $100; impact studies, $14,500; and fatigue tests of structural welds, $5,000. In addition, $35,000 was appropriated for carrying out the Engineering Division phases of the work being undertaken by the Joint Committee on Relation Between Track and Equipment. Of this latter amount, $5,000 is for rolling-load tests to determine the relationship between wheel load and wheel diameter; $20,000 is for a continuation of the present locomotive counterbalance tests; and $10,000 is for studies to be conducted to study the relationship between rail and wheel gage and contour.

Only two committees held meetings during December, these being the Committee on Water Service, Fire Protection and Sanitation, which met in New York, on December 2, and the Committee on Rail, which met in Chicago, on December 5. With the work on reports to be presented at the March convention practically complete, only one committee has scheduled a meeting in January, this being the Committee on Economics of Railway Location and Operation, which will meet in Pittsburgh, Pa., on January 29 and 30.

Personal Mention

General

Roy C. Matthews, division engineer of the Panhandle & Santa Fe, with headquarters at Slaton, Tex., has been promoted to acting trainmaster of the Slaton division, with the same headquarters. A biography of Mr. Matthews was published in the March, 1941, issue of *Railway Engineering and Maintenance,* following his promotion to division engineer.

J. E. Crawford, vice-president-assistant to the president of the Norfolk & Western, with headquarters at Roanoke, Va., and an engineer by training and experience, retired on December 31, after more than 38 years continuous service. **R. H. Smith,** vice-president and general manager, and also an engineer by training and experience, has been appointed vice-president in charge of operation, with headquarters as before at Roanoke. The positions of vice-president-assistant to the president and vice-president and general manager have been abolished. **J. P. Jackson,** superintendent of the Pocahontas division, with headquarters at Bluefield, W. Va., and an engineer by training and experience, has been advanced to general superintendent of the Eastern General division, with headquarters at Roanoke.

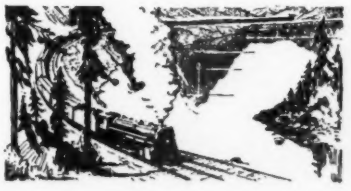
Guy S. Smith, whose promotion to assistant superintendent of the Joplin-White River divisions of the Missouri Pacific, with headquarters at Nevada, Mo., was reported in the December issue, was born at Imperial, Neb., on December 20, 1889, and graduated from the University of Kansas in 1912. On May 30 of the same year, he entered railway service with the Missouri Pacific, serving as rodman and instrumentman on the Central Kansas, Southern Kansas and Central divisions until 1917, when he was promoted to assistant engineer, in which capacity he was located first on the Central division and later on the Wichita division. From 1920 to 1926 he was assistant engineer in the office of the chief engineer and the engineer maintenance of way at St. Louis, Mo., when he became assistant division engineer of the Colorado division. In May, 1926, he was made assistant engineer on the Southern Kansas division, with headquarters at Coffeyville, Kan., and in October, 1927, he was promoted to division engineer of the Illinois division, with headquarters at Bush, Ill., later being transferred successively to Wynne, Ark., and Monroe, La. In October, 1931, Mr. Smith was appointed assistant engineer at Little Rock, Ark., and in 1933 he was advanced to assistant division engineer at Nevada. He was promoted to division engineer at Nevada in 1935.

Armand T. Mercier, vice-president of the Southern Pacific Company, with headquarters at San Francisco, Cal., and an engineer by training and experience, has been elected president, a director and a member of the Executive committee of that company, and **Donald J. Russell,** assistant to the president, and also an engineer by training and experience, has been advanced to vice-president, succeeding Mr. Mercier. A photograph and biography of Mr. Russell were published in the July issue, following his promotion to assistant to the president.

Mr. Mercier was born in New Orleans, La., on December 11, 1881, and graduated from Rugby academy and Tulane university, completing a course in civil engineering at the latter school in 1903. He first entered railway service in January, 1904, as a transitman and clerk to a roadmaster on the Southern Pacific at Los Angeles, Cal. During the following four years, he was advanced successively through the positions of assistant gang foreman, assistant engineer in charge of reconstruction work along the Colorado river, general foreman and engineer of bridges and buildings in charge of steel bridge construction and engineer and general foreman in charge of terminal construction work at San Pedro, Cal., and Los Angeles. In 1908 he was appointed assistant division engineer of the Los Angeles division and in 1911 he was advanced to assistant district engineer of the Southern district.

Armand T. Mercier

The following year, Mr. Mercier was promoted to division engineer of the San Joaquin division, with headquarters at Bakersfield, Cal., and in 1913 he was transferred to the Los Angeles division. In February, 1917, he was advanced to assistant superintendent of the Shasta division, with headquarters at Dunsmuir, Cal., and in September, 1918, he was promoted to superintendent of the Portland division, with headquarters at Portland, Ore. Three years later, Mr. Mercier became general manager of the San Diego & Arizona (now the San Diego & Arizona Eastern), a subsidiary of the Southern Pacific, with headquarters at San Diego, Cal., and in April, 1927, he was elected also president of that road. On July 3, 1929, he was elected vice-president and general manager of the Pacific Electric, another important subsidiary of the Southern Pacific, with headquarters at Los Angeles, and in the spring of 1933 he was moved to San Francisco as general manager of the Southern Pacific, Pacific Lines. Five years later, Mr. Mercier was elected a vice-president of the company, which position he has held until his recent advancement to the presidency.



Engineering

Clyde E. Hightower has been appointed cost engineer on the Denver & Rio Grande Western, with headquarters at Denver, Colo., instead of engineering assistant, as incorrectly reported in the December issue.

C. J. Code, assistant to chief engineer—maintenance of way, Central Region of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been promoted to engineer of tests—maintenance of way, with headquarters at Altoona, Pa.

H. R. Hart, assistant division engineer on the Atchison, Topeka & Santa Fe, with headquarters at San Francisco, Cal., has been promoted to division engineer of the newly-created San Francisco Terminal division, with the same headquarters.

J. F. Zanolio, whose promotion to acting division engineer on the Denver & Rio Grande Western, with headquarters at Grand Junction, Colo., was reported in the September issue, has been promoted to division engineer, with the same headquarters.

N. M. Waddell, assistant division engineer on the Canadian National at Brandon, Man., has been promoted to division engineer of the Portage-Brandon division, with headquarters at Winnipeg, Man., succeeding **E. R. Millidge,** deceased.

H. R. Wilkinson, roadmaster on the Canadian National at Biggar, Sask., has been promoted to division engineer, with headquarters at Kamloops, B. C. **B. E. Valde,** roadmaster on the Smithers division, has been appointed engineer, Prince Rupert dry dock, Prince Rupert, B. C.

W. H. Bettis, maintenance engineer of the Norfolk & Western, has been appointed assistant engineer, with headquarters as before at Roanoke, Va., and **B. E. Crumpler,** draftsman in the engineering department, has been promoted to maintenance engineer, succeeding Mr. Bettis.

J. E. South, office engineer in the office of the chief engineer of the Eastern region of the Pennsylvania, has been appointed assistant engineer bridges in the same office. **J. Lose, Jr.,** master carpenter of the Philadelphia Terminal division, at Philadelphia, Pa., has been appointed assistant engineer in the office of the chief engineer, Eastern region.

Jesse P. Walton, assistant engineer of bridges and buildings of the Central region of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been promoted to engineer of bridges and buildings of the Western region, with headquarters at Chicago, succeeding **Einar Weidemann,** whose death on November 12 was reported in the December issue. **Edward**

W. Prentiss, designing engineer at Chicago, has been advanced to assistant engineer of bridges and buildings of the Western region, with the same headquarters, a newly created position.

Orie H. Wainscott, whose appointment as assistant to the engineer maintenance of way of the Illinois Central, with headquarters at Chicago, was reported in the December issue, was born at Kinmundy, Ill., on March 3, 1887, and graduated from Valparaiso University and Purdue University, completing a course in civil engineering at the latter school in 1912. He entered railway service on July 12, 1912, as a chainman on preliminary surveys and location for the Illinois Central at Canton, Miss., and in December, 1912, he was promoted to rodman on location at Dubuque, Iowa. In March, 1913, he was transferred to the division engineering force at Greenville, Miss., and four months later he was transferred to Vicksburg, Miss. From December, 1914, to March, 1916, Mr. Wainscott served as masonry inspector at various points in Mississippi and Tennessee and on the latter date he was appointed a draftsman in the bridge

Orie H. Wainscott

department at Chicago. In August, 1916, he was promoted to assistant engineer in the office of the chief engineer. Mr. Wainscott continued in this position until his recent appointment, with the exception of the period from May 5, 1917, to September 5, 1919, when he served as a captain in the Engineers Corps, spending 20 months overseas in the First World War.

Robert Alton Emerson, whose promotion to division engineer on the Canadian Pacific, with headquarters at Brandon, Man., was reported in the December issue, was born at Plum Coulee, Man., on April 12, 1911, and graduated in civil engineering from the University of Manitoba in 1930. He entered railway service in May, 1928, between terms at school, as a rodman at Kenora, Ont., and in 1929 served as an inspector of rock ballasting. On May 2, 1930, he was appointed a transitman at Kenora, Ont. On October 1, 1930, he left the Canadian Pacific to become instructor in civil engineering at the University of Manitoba and later became successively locating engineer for the Department of Northern Development of the Province of Ontario, post-graduate student of railway transportation at Yale University under a Strathcona Fellowship and instrumentman for the Department of Northern Development. On April 1, 1935,

Robert Alton Emerson

he re-entered the service of the Canadian Pacific as a transitman at Vancouver, B.C., and was later transferred to Revelstoke, B.C., and Regina, Sask. Mr. Emerson was promoted to roadmaster on the Portage division, with headquarters at Deloraine, Man., in January, 1939, served as acting division engineer at Ft. William, Ont., in March, 1941, and was later transferred to Virden, Man., as roadmaster, where he was located until his recent promotion.

George Lyon Morrison, whose promotion to division engineer of the Salt Lake division of the Southern Pacific, with headquarters at Ogden, Utah, was reported in the December issue, was born at La Junta, Colo., on May 3, 1898, and graduated in civil engineering from Rice Institute, Houston, Tex., in June, 1923. He entered railway service in September, 1913, working in the transportation department of the Southern Pacific at El Paso, Tex., and at Houston, while attending high school and university. In July,

George Lyon Morrison

1923, he was appointed a rodman at Los Angeles, Cal., later being advanced through various positions to assistant engineer. On October 1, 1937, he was appointed a general foreman in the bridge and building department at Los Angeles and on February 1, 1938, he was promoted to roadmaster, with the same headquarters. On October 1, 1940, he was appointed assistant trainmaster at Calexico, Cal., and on March 16, 1941, he was advanced to assistant terminal superintendent at Los Angeles, which position he held until his recent appointment.

Robert Waller Marye, assistant chief engineer of the Atlantic Coast Line, has been promoted to chief engineer, effective January 1, with headquarters as before, at Wilmington, N. C., to succeed **J. E. Willoughby,** who has been appointed consulting engineer. A biography of Mr. Marye was published in the August, 1941, issue, following his promotion to assistant chief engineer.

C. Paul Schantz, whose promotion to assistant chief engineer maintenance of way of the Eastern region of the Pennsylvania at Philadelphia, Pa., was reported in the December issue, was born on April 3, 1893. He was graduated from Drexel Institute in 1912 and entered railroad service with the Pennsylvania on October 1, 1912, as a chainman on field surveys and construction, becoming a draftsman

C. Paul Schantz

on December 1, 1912. Mr. Schantz then served in the office of the engineer of bridges and buildings as supervising draftsman, designing engineer and office engineer, successively, becoming assistant engineer of bridges in 1930, the position he held until his recent promotion. From 1923 to 1927, Mr. Schantz was an instructor in major civil engineering subjects at Drexel Institute evening school. He is co-author of a book entitled Bridge Engineering, published in 1931.

John J. Clutz, division engineer of the Indianapolis division of the Pennsylvania, with headquarters at Indianapolis, Ind., has been transferred to the Washington terminal, with headquarters at Washington, D. C., and **L. G. Walker, Jr.,** assistant division engineer of the Ft. Wayne division, has been promoted to division engineer at Indianapolis, succeeding Mr. Clutz. **R. W. Grigg,** supervisor of track on the New York division, with headquarters at New Brunswick, N. J., has been promoted to assistant division engineer of the Ft. Wayne division, with headquarters at Ft. Wayne, Ind., relieving Mr. Walker. **T. J. Murray,** supervisor of track on the Maryland division of the Pennsylvania, with headquarters at Wil-

(Continued on page 54)

Here is an ideal combination for keeping railroad embankments in tip-top shape at low cost. The tractor is an International TD-18 Diesel TracTracTor, equipped with bullgrader.

IN THESE TIMES

Let's Face the Facts with *Common Sense*

THESE are *different* times than any of us have experienced. *All* of us must now face facts with *common sense* for a mutual solution of today's problems.

One fact to be faced is this: there may not be enough new machines to go around. International Harvester will do its best to provide its customers with as much new machinery as possible. But plans laid today must be flexible enough to meet tomorrow's situation.

In such a time users can appreciate what International QUALITY and International SERVICE mean. International TracTracTors, Wheel Tractors, and Power Units are having to work harder and live longer. They're doing just that, because they are *designed* and *built* for the *long pull ahead.* A broad background of manufacturing, engineering, and metallurgical experience stands behind every tractor and engine carrying the International nameplate. International equipment is *proved all ways for come what may!*

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INTERNATIONAL Industrial Power

mington, Del., has been promoted to assistant division engineer of the New York division, with headquarters at Jersey City, N. J., to succeed **M. C. Bitner,** who has been promoted to division engineer of the Erie & Ashtabula division.

Track

E. P. Sax has been appointed roadmaster on the Denver & Rio Grande Western, with headquarters at Minturn, Colo., succeeding **E. C. Barnes.**

W. W. Simons has been appointed assistant supervisor of track on the Maryland division of the Pennsylvania, with headquarters at Washington, D. C.

R. A. Fox has been appointed roadmaster on the Denver & Rio Grande Western, with headquarters at Green River, Utah, succeeding **Eston Royse,** transferred.

W. R. Pieschke, roadmaster on the Atchison, Topeka & Santa Fe, at Gallup, N.M., has been transferred to Corcoran, Cal., in charge of a newly-created roadmaster's territory.

Charles Hetisimer, a section foreman on the Chesapeake & Ohio, has been promoted to supervisor of track, with headquarters at Richmond, Ind., succeeding **C. A. Snodgress,** whose death on November 12, is reported elsewhere in these columns.

Joseph Corbett, an extra gang foreman on the New York Central, has been promoted to assistant supervisor of track of subdivision 16 of the St. Lawrence division, with headquarters at Richland, N.Y., succeeding **G. P. Cook,** who has retired.

J. B. Johnson, general foreman of extra gangs on the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to roadmaster, with headquarters at Terre Haute, Ind., succeeding **Fred White,** who has been assigned to other duties.

George F. Williams has been appointed roadmaster on the Texas & Pacific at Big Spring, Tex., a newly created position. **J. C. Rich** has been appointed general foreman in charge of track work, with headquarters at Texarkana, Tex., also a newly created position.

G. I. Linden, section foreman on the Asquith subdivision of the Canadian National, has been promoted to acting roadmaster at Biggar, Sask., succeeding **H. R. Wilkinson,** whose promotion to division engineer at Kamloops, B. C., is reported elsewhere in these columns. **A. L. Peterson,** yard foreman at Prince Rupert, B. C., has been advanced to acting roadmaster on the Smithers division, relieving **B. E. Valde,** whose appointment as engineer, Prince Rupert dry dock, is also reported elsewhere in these columns.

Duncan Robert Johnston, whose promotion to roadmaster on the Canadian Pacific, with headquarters at Leader, Sask., was reported in the December issue, was born at Maple Creek, Sask., on September 30, 1905, and entered railway service on May 2, 1920, as a timekeeper on an extra gang on the Medicine Hat division. On April 1, 1921, he became a sectionman at Gleichen, Alta. On July 14, 1925, he was promoted to section foreman at Milo, Alta., and on June 28, 1941, he was advanced to relieving roadmaster on the Lethbridge division, which position he held until his recent promotion.

George F. Borgman, whose retirement on October 31 as supervisor of track on the New York Central (Big Four), with headquarters at Bellefontaine, Ohio, was reported in the November issue, was born in Manchester township (near Guilford), Ind., on July 14, 1880, and entered railway service on July 3, 1899, as a section laborer for the Big Four. On May 1, 1901, he became a brakeman at Guilford, later serving as a fireman and operator. On January 16, 1913, he became a section laborer at Sunman, Ind., and on July 1, 1913, he was promoted to section foreman at Lebanon, Ind. On January 1, 1918, Mr. Borgman was advanced to supervisor of track at Bellefontaine.

William A. Summers, whose promotion to supervisor of track on the New York Central (Big Four), with headquarters at Harrisburg, Ill., was reported in the November issue, was born at Norris City, Ill., on October 5, 1881, and entered railway service in 1902 as a section laborer on the Big Four at Olmstead, Ill. In June, 1904, he was promoted to section foreman at Gossett, Ill., and in March, 1905, he became an extra gang foreman on construction work at Gossett, returning to his position as section foreman in 1909. In September, 1918, he was appointed yard foreman at Harrisburg, Ill., and in January, 1928, Mr. Summers was advanced to supervisor of track, with the same headquarters. He was reappointed yard foreman at Harrisburg in October, 1930, which position he held until his recent promotion.

Robert D. Brown, whose retirement as roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Prescott, Ariz., was reported in the November issue, was born at Hartford, Conn., on November 22, 1875, and attended Yale University from 1895 to 1898. He entered railway service on May 1, 1901, as a masonry inspector and assistant engineer on the Santa Fe at Los Angeles, Cal., and in April, 1906, was appointed assistant engineer at Fresno, Cal. In June, 1915, Mr. Brown, went with the Southern Pacific as an assistant engineer at Bakersfield, Cal., and in November, 1916, he returned to the Santa Fe as a transitman at San Bernardino, Cal. In May, 1920, he was transferred to Phoenix, Ariz., and two years later he was promoted to assistant division engineer at Needles, Cal. Mr. Brown was appointed roadmaster, with headquarters at Kingman, Ariz., in December, 1922, and in January, 1936, he was transferred to Prescott.

G. C. Vaughan, supervisor of track on the St. Louis division of the Pennsylvania, with headquarters at Greenville, Ill., has been transferred to the Maryland division, with headquarters at Wilmington, Del., to replace **T. J. Murray,** whose promotion to assistant division engineer is noted elsewhere in these columns. **C. J. Webb,** acting assistant supervisor of track, has been promoted to supervisor of track on the Logansport division. **J. P. Zearley,** supervisor of track on the Columbus division, with headquarters at Richmond, Ind., has been transferred to the New York division, with headquarters at New Brunswick, N. J., to replace **R. W. Grigg,** whose promotion to assistant division engineer is reported elsewhere in these columns, and **A. J. Roper,** assistant supervisor of track on the Eastern division, has been promoted to supervisor of track at Richmond, relieving Mr. Zearley.

L. F. Shields, assistant supervisor of track at Newport, Pa., has been promoted to supervisor of track at Carrothers, Ohio, succeeding **G. M. Smith,** who has been transferred to Columbus, Ind., replacing **M. B. Jamin,** resigned. **F. R. Timmons,** an extra gang foreman on the Ft. Wayne division, has been advanced to assistant supervisor of track at Newport, relieving Mr. Shields.

J. L. Tedesco, assistant supervisor of track on the Philadelphia division, has been promoted to supervisor of track at Cadillac, Mich., succeeding **Malcolm Young, Jr.,** who has been transferred to Warsaw, Ind., relieving **W. W. Clarke,** who has been granted a leave of absence because of illness. **A. B. Baker,** assistant on the engineer corps of the Eastern region, has been promoted to assistant supervisor of track on the New York division, with headquarters at Jamesburg, N. J., replacing **Edward Wollett,** who has been transferred to the Philadelphia division. **J. L. Forrester,** assistant on the engineer corps of the Western region, has been promoted to assistant supervisor of track at East Liberty, Pa.

Bridge and Building

C. O. Henry, supervisor of bridges and buildings on the New York Central (Big Four) at Anderson, Ind., has been transferred to Cleveland, Ohio.

C. F. Gilbert, a carpenter foreman on the Chesapeake & Ohio, has been promoted to supervisor of bridges and buildings with headquarters at Peru, Ind., succeeding **F. H. Smythe,** who has retired.

G. C. Blackaller, whose appointment as acting master carpenter on the Denver & Rio Grande Western, with headquarters at Alamosa, Colo., was reported in the September issue, has been promoted to master carpenter, with the same headquarters.

H. M. Harlow, assistant supervisor of bridges and buildings on the Chesapeake & Ohio, has been appointed acting assistant general supervisor of bridges and buildings, with headquarters at Richmond, Va., succeeding **F. B. Robins,** who has been granted a leave of absence to permit him to enter government service.

F. E. Shanklin, supervisor of bridges and buildings on the Chicago & North Western at Chadron, Neb., has retired and **L. R. Pennington,** supervisor of bridges and buildings at Pierre, S. D., has been transferred to Chadron, succeeding Mr. Shanklin. **Knight Hallock,** supervisor of bridges and buildings at Fremont, Neb., has been transferred to Pierre, relieving Mr. Pennington, and **Herman Heiszenbuttel,** supervisor of bridges and buildings at Norfolk, Neb., has been

(Continued on page 56)

WOODINGS-VERONA TOOL WORKS

VERONA, PA.

Since 1873

Greetings

To All Our Friends and Customers

Another Year Has Passed

and We Like to Feel

It Has Added to the Esteem

in Which

Our Products and Our Organizations

Are Held

WOODINGS FORGE *and* TOOL COMPANY

VERONA, PA.

transferred to Fremont, replacing Mr. Hallock. The position of supervisor of bridges and buildings at Norfolk has been abolished.

G. H. Perry, assistant master carpenter of the Philadelphia Terminal division of the Pennsylvania, has been promoted to master carpenter of the Erie & Ashtabula division, with headquarters at New Castle, Pa., succeeding **V. A. Leisher,** who has been transferred to the Maryland division, with headquarters at Baltimore, Md., to replace **P. R. Benton,** who has been transferred to the Philadelphia Terminal division with headquarters at Philadelphia. Mr. Benton succeeds **J. Lose, Jr.,** whose appointment as assistant engineer in the office of the chief engineer, Eastern region, with headquarters at Philadelphia, is noted elsewhere in these columns. **G. P. Hayes,** assistant master carpenter of the Philadelphia division, has been transferred to the Philadelphia Terminal division.

Special

R. C. O'Mar has been appointed supervisor of work equipment of the Western lines of the Southern, with headquarters at Cincinnati, Ohio, a new position.

Obituary

Crowell A. Snodgress, supervisor of track on the Chesapeake & Ohio, with headquarters at Richmond, Ind., died of coronary occlusion on November 12 at Peru, Ind.

Benjamin C. Metcalf, roadmaster on the Missouri-Kansas-Texas, with headquarters at Cisco, Tex., died in a Dallas (Tex.) hospital on November 6.

W. A. Enderle, whose retirement on May 31, 1941, as roadmaster on the Southern Pacific Lines in Texas and Louisiana, with headquarters at San Antonio, Tex., was reported in the July issue, died at his home in that city on November 20. A biography of Mr. Enderle was published in the September issue.

John B. Kelly, Sr., who retired on June 15, 1923, as inspector of maintenance of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., died on November 19. Mr. Kelly was born at Whitewater, Wis., on December 23, 1855, and entered railway service as a boy as a section laborer on the Minnesota Central (now part of the Chicago, Milwaukee, St. Paul & Pacific) and in 1879 was engaged in a supervisory capacity on the construction of the short line between St. Paul, Minn., Minneapolis and on to Cologne. Two years later he was appointed roadmaster at Milbank, S. D., later being transferred to Aberdeen, S. D. In 1888 he went with the Northern Pacific as roadmaster at Mandan, N. D., and in 1894 he went with the Great Northern as general roadmaster at Havre, Mont. Later in 1894 Mr. Kelly became a roadmaster on the St. Louis Southwestern at Brinkley, Ark., and was subsequently promoted to general roadmaster. In 1899 he was placed in charge of the construction of a part of the Little Rock & Hot Springs Western (now a part of the Missouri Pacific from Hot Springs, Ark., to Benton and of the Chicago, Rock Island & Pacific from Little Rock, Ark., to Hot Springs). In 1900 Mr. Kelly returned to Minnesota as general roadmaster of the Minneapolis & St. Louis, with headquarters at Minneapolis, and his title was later changed to inspector of maintenance. Mr. Kelly was a life member of the Roadmasters' and Maintenance of Way Association of which association he was one of the pioneer members and at the time of death is believed to have been the oldest member.

Supply Trade News

General

S. A. McWilliams, Ltd., Toronto, Ont., has been appointed representative for the **Permutit Company of Canada, Ltd.,** in the province of Ontario.

The Barrett Company has been consolidated with its parent company, the **Allied Chemical & Dye Corporation,** and will hereafter conduct its business as the Barrett Division of the parent company.

Personal

James B. Hayden, sales manager of the **Industrial Brownhoist Corporation,** Bay City, Mich., has been elected vice-president in charge of sales.

T. I. Phillips has been elected a vice-president of the **Westinghouse Electric & Manufacturing Co.** Mr. Phillips started with this company as a tool maker in 1915 and has been assistant to the president of the company since February 14 of this year.

F. R. Gammon has been appointed manager of sales of the New York district sales office of the **Carnegie-Illinois Steel Corporation,** effective January 1, 1942, to succeed **James R. Mills,** who will retire. Mr. Gammon joined the sales force of the Carnegie-Illinois Steel Corporation as a special representative in 1936, and on January 1, 1938, was made manager of sales in Cleveland, Ohio, which position he now relinquishes.

E. R. Goss has been appointed branch manager of the El Paso, Tex., office of the **Chicago Pneumatic Tool Company** to succeed **E. J. Coughlin,** who died in an automobile accident on October 14. Mr. Goss started with the Chicago Pneumatic Tool Company in 1929 as a salesman in the El Paso office. He was transferred to the Los Angeles, Cal., branch office in 1933, returning to El Paso in 1937 and being located at Phoenix, Ariz., until the present time.

A. A. Gustafson has been appointed director of personnel and safety of the **Buda Company,** Harvey, Ill. Mr. Gustafson is a graduate mechanical engineer from Purdue University and has had fifteen years experience with manufacturing concerns in the Chicago area. During the last year and a half, he was employed by the U. S. Federal government as a safety engineer in charge of the organization and direction of a safety division for one of the Federal Government departments in Illinois.

Ralph R. Hayes has been appointed eastern district sales manager of the **Buda Company,** with headquarters at New York, succeeding **Lew Crafts,** resigned. Mr. Hayes was for two years eastern engine representative for the Caterpillar Tractor Company, five years in the U. S. Department of Justice Customs Agency service, six years as line construction officer of boats for the U. S. Coast Guard, Washington, D. C., and six years with the U. S. Navy.

Howard I. Prentice, sales engineer for the **Cleveland Frog & Crossing Company,** Cleveland, Ohio, has been promoted to manager of sales, with headquarters at Cleveland. Mr. Prentice graduated in civil engineering from the Case School

Howard I. Prentice

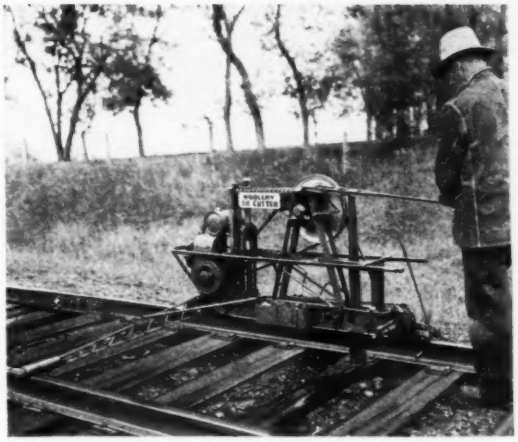
of Applied Science in 1911 and in 1912 joined the engineering department of the Cleveland Frog & Crossing Company. In 1928 he was made sales engineer, which position he has held until his recent appointment.

A. C. Pickett, who was with the **Johns-Manville Sales Corporation** from 1922 to 1939, and recently has been connected with the **Gustin-Bacon Manufacturing Company,** has been appointed assistant division sales manager of the Western division of the Transportation department of Johns-Manville, with headquarters at Chicago. Early in his career, Mr. Pickett served in the engineering department of the Missouri-Kansas-Texas.

Obituary

Joseph A. Donahey, 63, manager of sales of the **Cleveland Frog & Crossing Co.,** with headquarters at Cleveland, Ohio, died at the Lakeside hospital in that city on December 8 after a short illness. Mr. Donahey was born at Boone, Iowa, and before the first World War served as chief engineer and general superintendent of the Akron, Canton & Youngstown. During the war he served as captain of Company C, 147th Engineers and after the war became sales and service engineer of the Cleveland Frog & Crossing Co., at Cleveland. A few years later he was promoted to manager of sales, which position he held until his death.

To Complete Your 1942 Programs
USE THESE PROVEN AIDS!



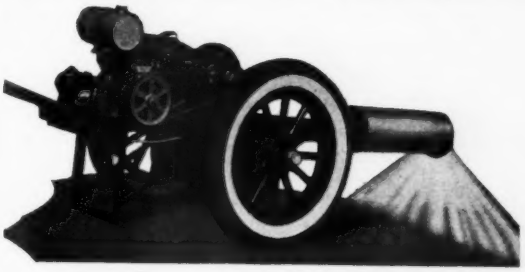
Woolery Tie Cutters

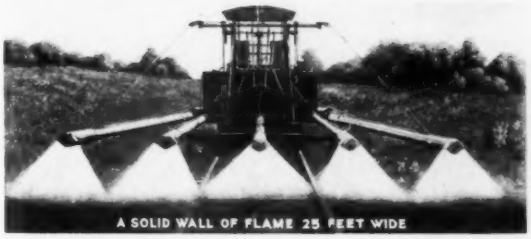
Speed-Up Tie Renewals—Save Labor

Never before were the time-and-labor-saving advantages of Woolery Tie Cutters more important . . . for programs in 1942 will be markedly larger and labor increasingly scarcer and more costly. Investigators can usually find the One Best Way of doing a thing. Using a Woolery Tie Cutter with a properly organized crew and correct procedure provides that One Best Way for spot tie renewals.

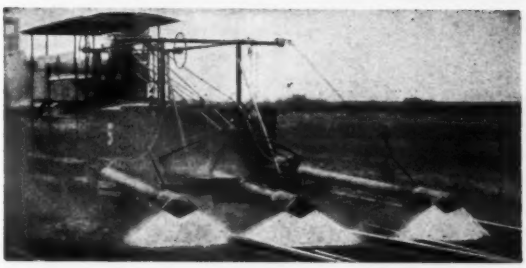
By cutting the ties into three pieces that can be easily and quickly removed, the Tie Cutter does away with the laborious process of "digging out" ties. Trenching is eliminated. Only one-third as much ballast is handled, thereby reducing surfacing 50%. The old tie bed is shaved down just enough to admit the new tie which then rests on a solid bed and the usual soft spot is prevented.

These Tie Cutters work in all kinds of ballast and will save money on any Railroad when used as outlined.





A SOLID WALL OF FLAME 25 FEET WIDE



Woolery Weed Burners

NOW USED BY OVER 60 RAILROADS

More than 60 roads are now using Woolery Weed Burners . . . convincing proof of their efficient, economical performance in removing weeds from the track.

And there's a Woolery Weed Burner for every track need. Woolery Giant Octopus Model with five or three burners for main line track; Midget Octopus with two burners for branch line and yard tracks; the Junior Portable Model—for use on or off track—at crossings, around buildings, in storage yards—and for removing ice from switches, culverts, drainage pipes, etc., this winter.

Write for information.

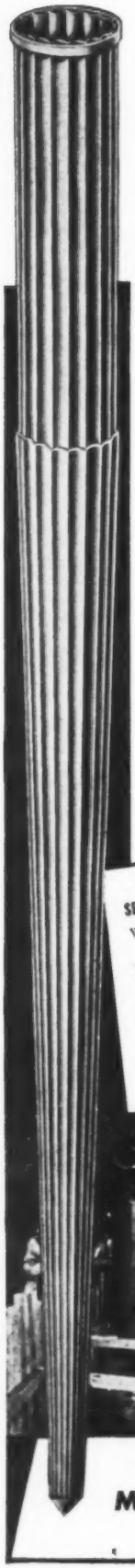
WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

TIE CUTTERS • SWITCH HEATERS • MOTOR CARS

RAILWAY WEED BURNERS • BOLT TIGHTENERS



LOW HEADROOM Caused No Headaches Here!

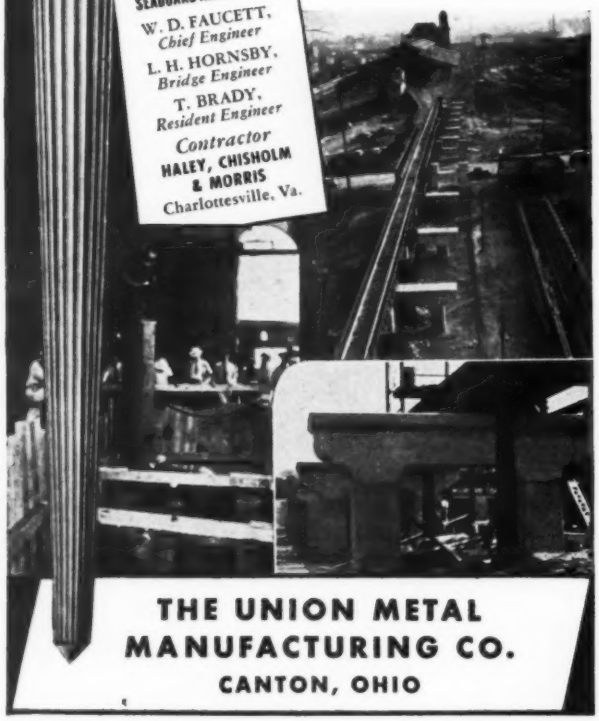
Extendable Monotubes Permit Installation of Elevated Track "Under Traffic"

CONSTRUCTION of this 4000-ft. elevated track and viaduct in Richmond, Va., by the Seaboard Airline Railway, presented a major piling problem. Plans called for building the structure under the present tracks, which meant driving many of the piles for the 59 piers in locations offering only about 20 ft. of headroom. Only a sectional pile could be used if traffic was to be maintained. Otherwise, traffic would have to be rerouted and portions of the old structure removed at a tremendous cost in both time and money.

Use of Union Metal Extendable Monotubes proved to be the practical solution. 800 of these tapered steel casings, averaging 20 ft. in length, were driven in 10-ft. sections. Despite difficult working conditions, installation of the finished cast-in-place piles was completed in about 50 working days.

Write today for catalog describing Extendable Monotubes — they can speed your job and save you money.

Engineers
SEABOARD AIRLINE R. R.
W. D. FAUCETT, *Chief Engineer*
L. H. HORNSBY, *Bridge Engineer*
T. BRADY, *Resident Engineer*
Contractor
HALEY, CHISHOLM & MORRIS
Charlottesville, Va.

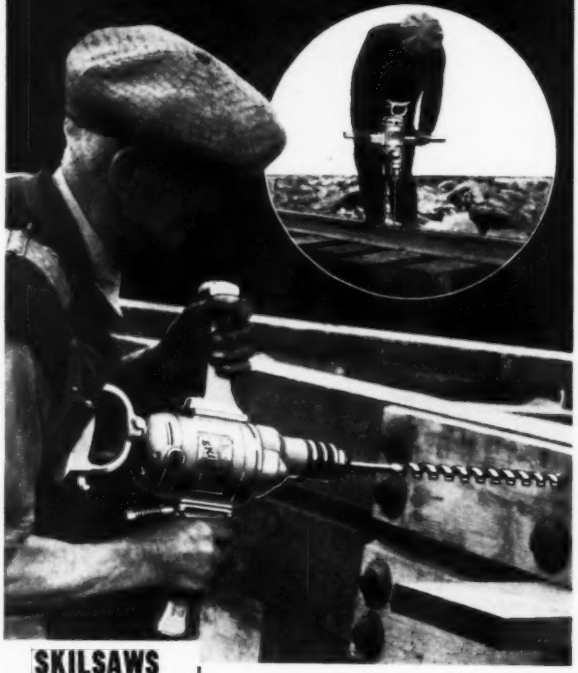


THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

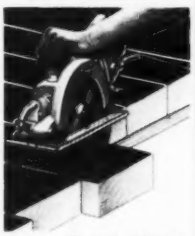
In Maintenance . . . in Construction . . . *everywhere*

SKILSAW DRILLS WORK FASTER

. . . because they're more powerful!



SKILSAWS



Save time, save money on all sawing!

● SKILSAW, America's largest selling electric handsaw, is ideal for Bridge and Building crews. Cuts daps in ties, saws all lumber in maintenance and construction. Cuts metals, stone and compositions. Works from light socket or portable generator. 9 POWERFUL MODELS.

There's *extra* power in SKILSAW DRILLS for *extra* drilling speed on every job . . . and these powerful tools are lighter, more compact, easier to use. That's why SKILSAW DRILLS are so widely preferred by railroad men for all drilling . . . from lightest repair work to heaviest timber boring on bridge and building construction. They do *more jobs* and do them faster . . . *at lowest operating costs!*

From grip to bit SKILSAW DRILLS are designed and built to bring you the best in low-cost, trouble-free drilling. Your distributor will gladly demonstrate them for you. 23 POWERFUL MODELS.

SKILSAW, INC.
5053 Elston Ave. Chicago

New York ● Boston ● Buffalo ● Philadelphia ● Cleveland ● Detroit ● Kansas City ● Atlanta ● New Orleans ● Dallas ● Los Angeles ● Oakland ● Seattle ● Toronto, Canada

SKILSAW PORTABLE ELECTRIC TOOLS

★ *FOR THE DEFENSE OF AMERICA* ★

North American's Dallas Plant

DEPENDS ON LAYNE WELLS AND PUMPS

Startling the Nation by going into production just one hundred and twenty days after construction began, the Dallas plant of North American Aviation, Inc., is now rolling out their famous Army AT-6A and Navy SNJ-3 Scout Trainer Planes. Factory and assembly space is completely air conditioned as an aid to accuracy, speed and efficiency in manufacturing.

As was the case with defense projects throughout the Nation, North American chose Layne Wells and Pumps for their water supply. Something over 1,400,000 gallons of water daily is available from their two Layne Units . . . and that capacity can go on day after day, month after month for years to come. In efficiency and dependability Layne Wells and Pumps have no parallel.

When the final chapter of America's greatest war is written, the part played by Layne Wells and Pumps will be a very absorbing story. Certainly in all the world, as hundreds of installations testify, there are no finer Well Water Systems. To meet the country's urgent demand for more and more production you may need more water. Act now! Communicate with Layne. Wire or address,

LAYNE & BOWLER, INC.
Memphis, Tenn.

LAYNE PUMPS & WELL WATER SYSTEMS

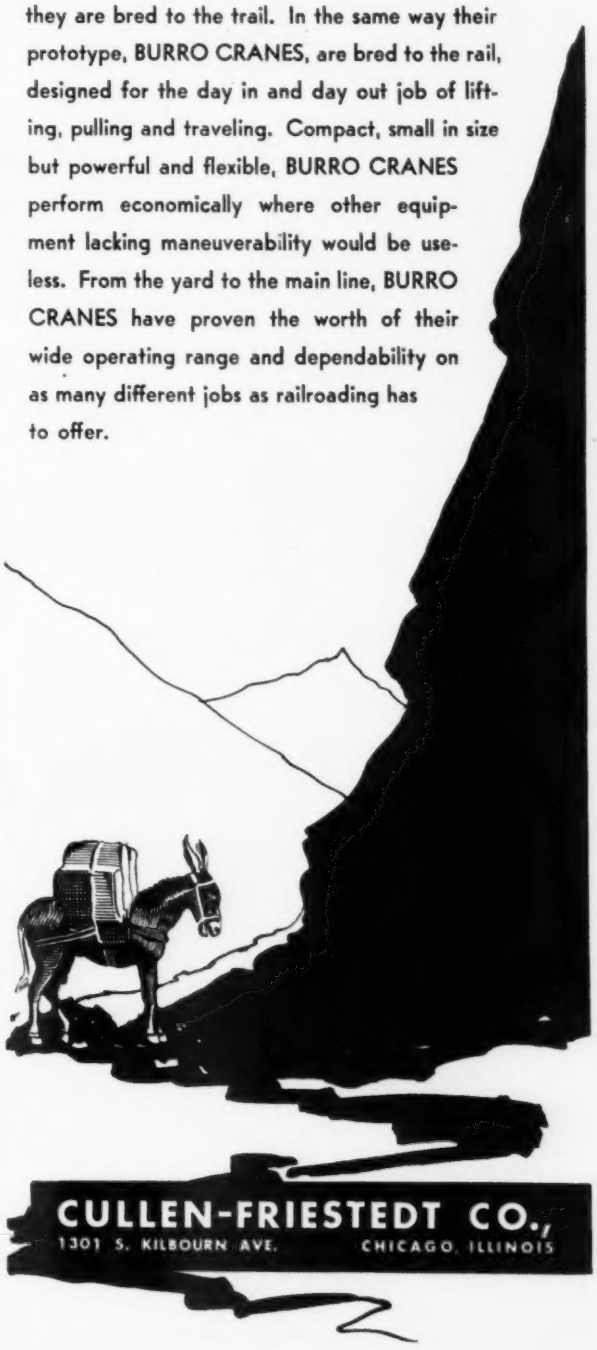
Affiliated Companies

Layne-Arkansas Company	Stuttgart, Ark.
Layne-Atlantic Company	Norfolk, Va.
Layne-Bowler New England Corp.	Boston, Mass.
Layne-Central Company	Memphis, Tenn.
Layne-Northern Company	Mishawaka, Ind.
Layne-Louisiana Company	Lake Charles, La.
Layne-New York Company	New York City.
Layne-Northwest Company	Milwaukee, Wis.
Layne-Ohio Company	Columbus, Ohio.
Layne-Texas Company	Houston, Texas
Layne-Western Company	Kansas City, Mo.
Layne-Western Company of Minnesota	Minneapolis, Minn.
International Water Supply, Ltd.	London, Ontario, Can.

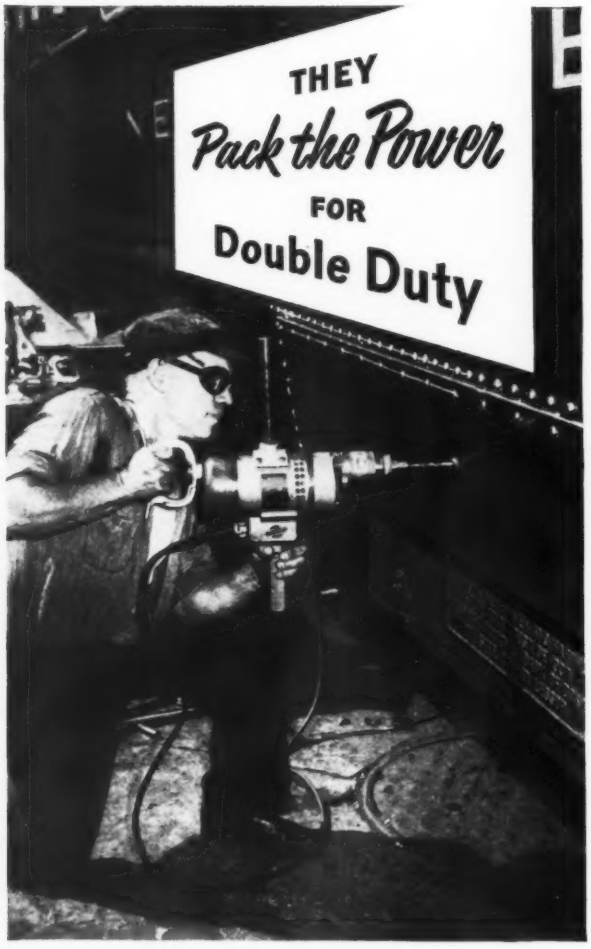
WORLD'S LARGEST WATER DEVELOPERS

The mountain and the Burro—

A mountain is no barrier to a burro, regardless of its size, because tough going, heavy loads and constant work never stop these little animals . . . they are bred to the trail. In the same way their prototype, BURRO CRANES, are bred to the rail, designed for the day in and day out job of lifting, pulling and traveling. Compact, small in size but powerful and flexible, BURRO CRANES perform economically where other equipment lacking maneuverability would be useless. From the yard to the main line, BURRO CRANES have proven the worth of their wide operating range and dependability on as many different jobs as railroading has to offer.



CULLEN-FRIESTEDT CO.
1301 S. KILBOURN AVE. CHICAGO, ILLINOIS



Outdoors . . . indoors . . . all along the line . . .

STANLEY ELECTRIC DRILLS

They're the busiest tools in any work crew's equipment. Designed for easy handling, even in the most difficult drilling spots. Set up in a Stanley Drill Stand, they become rugged, portable Drill Presses, ready for work in the shop or out along the line.

Stanley Universal Drill Motors operate efficiently either from portable generator sets or standard power lines. Stanley Electric Drills serve a double purpose – either indoors or outdoors.

Stanley Electric Drills are made in 15 sizes – capacities from ¼" to ⅞" in steel. Ask for a demonstration or specification sheets. Stanley Electric Tool Division, The Stanley Works, New Britain, Connecticut.

STANLEY ELECTRIC TOOLS

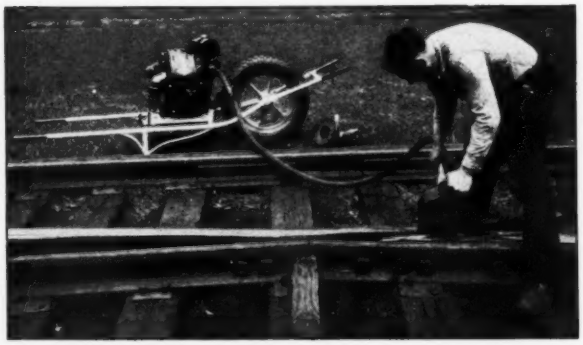
"COST LESS PER YEAR"

SAVING RAIL WILL HELP SAVE THE NATION

● **Steel is doubly precious now—in more ways than one. Doubly important, therefore, that rail life be conserved in every way possible. In this job, Railway Track-work Rail Grinders can do—are doing—their part, stopping the progressive damage caused by pounding fast, heavy traffic over corrugated rail, battered ends, worn switch points, frogs and crossings.**

To husband your steel, promote safety, conserve manpower, maintain fast schedules and "Keep 'em rolling," build up your fleet of Railway Track-work Grinders. They bring modern shop efficiency and accuracy to the way maintenance job.

Many models for choice. Write for newest Data Bulletins.



Model P-22 Railway Track-work Grinder—one of many models.

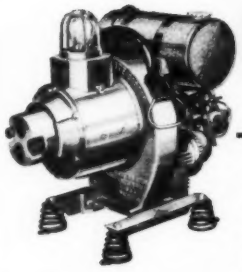
Railway Track-work Co.

3132-48 East Thompson St., Philadelphia

2090

We have to

STICK BY OUR GUNS

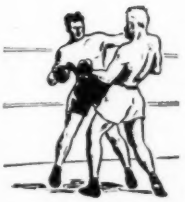


You can't hedge on a pledge. And Homelite has pledged itself to deliver a staggering number of portable generators, pumps and blowers for the armed forces of Uncle Sam. This has forced us to tighten our belts and cut deliveries, to our regular customers, down to a priority-governed minimum.

But Homelite makes this pledge to you. When you are able to get prompt deliveries of Homelite Portable Pumps, Generators and Blowers, you will get more advanced, more practical and more dependable units than ever before.

HOMELITE CORPORATION

2101 Riverdale Ave., Port Chester, N. Y.

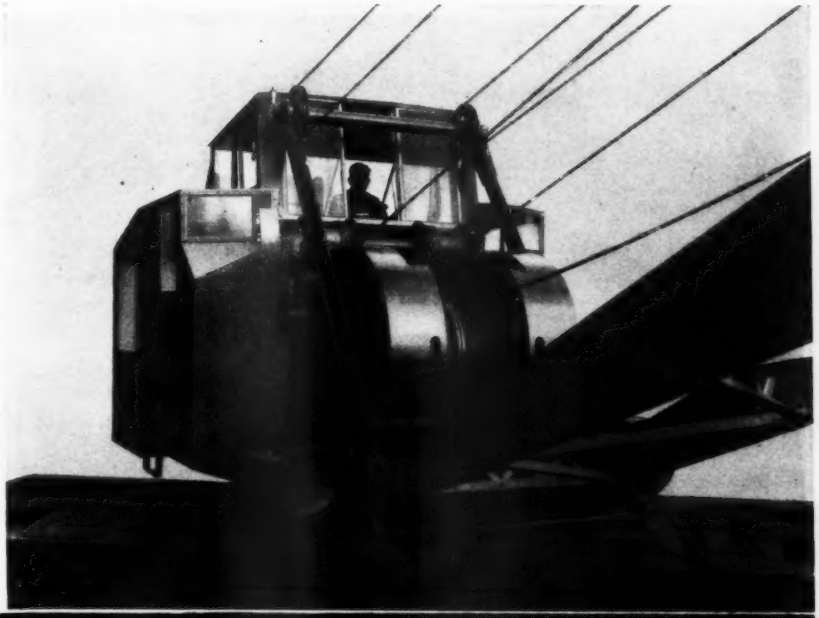


Industrial Brownhoist Cranes Are Built to Take It!

A good example of the sturdiness of I. B. cranes is the report of a 25-ton unit which started work for a big Eastern steel Company six years ago. Handling pig iron with a 55" magnet, eight to twenty-four hours a day, this crane has taken time out for repairs only 1.22% of its lifetime.

Yet this case of an I. B. crane doing its job 98.78% of the time is no isolated case. Brownhoist Cranes are operating like that the country over.

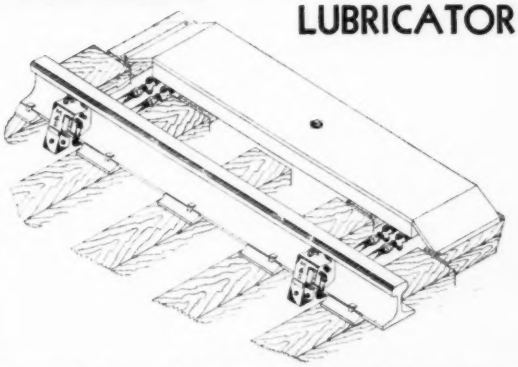
For I. B. cranes are extra-sturdy from wheels to boom tip. Their unusually rugged crab construction, powerful rotating gear mechanism, efficient power plant, convenient, smooth-working controls and 360° operator vision insure maximum efficiency with a minimum of maintenance. Write today for further facts.



INDUSTRIAL BROWNHOIST BUILDS BETTER CRANES

GENERAL OFFICES: BAY CITY, MICHIGAN • DISTRICT OFFICES: NEW YORK, PHILADELPHIA, PITTSBURGH, CLEVELAND, CHICAGO

M&S PNEUMATIC *Rail and Flange* LUBRICATOR



Lubricate Curve Rails With This Efficient and Low Cost Lubricator—Hundreds Are In Service

M & S Lubricators use low cost journal oil. Positive and permanent regulation of the amount and force of the lubricant is obtained by the Pneumatic Control and Constant Stroke. Extremely low maintenance is insured by the simple and rugged construction. The lubricator can be located on either curved or tangent rails and can be furnished with one, two or three discharge heads. This lubricator is peculiarly adapted for the lubrication of yards and grades. *Write for further information and prices.*

MOORE & STEELE CORPORATION

Owego, Tioga County, N. Y.

- Conserve Labor
- Increase Safety
- Cut Maintenance Costs

With *Mall* TRADE MARK

OFF-THE-TRACK POWER UNIT

Grinding Frogs

• This easily portable, 5 H.P., off-the-track, power unit will multiply the work capacity of maintenance and construction crews by adding shop speed and efficiency to 9 everyday, time-consuming jobs. Swivel-fitted, interchangeable, light-weight tools for Grinding, Sawing with Circular or Chain Saw, Sanding, Wire Brushing, Drilling in Wood, Concrete, Brick and Stone, Concrete Vibrating, Concrete Surfacing, and Pumping can be changed as easily as bits in a brace. The variable, V-belt drive gasoline engine is easy to start, runs by itself and operates all day on surprisingly little fuel. Easily wheeled along the right-of-way by one man. See it in action—AT OUR EXPENSE. Write TODAY for full information.

MALL TOOL COMPANY

RAILROAD DEPARTMENT

7746 SOUTH CHICAGO AVE. CHICAGO, ILL.

SALES OFFICES IN PRINCIPAL CITIES

Defense Savings Pay-Roll Allotment Plan

How company heads can help their country, their employees, and themselves

voluntary pay-roll allotment plan | helps workers provide for the future
helps build future buying power
helps defend America today

This is no charity plea. It is a sound business proposition that vitally concerns the present and future welfare of your company, your employees, and yourself.

During the post-war period of readjustment, you may be faced with the unpleasant necessity of turning employees out into a confused and cheerless world. But you, as an employer, can do something *now* to help shape the destinies of your people. Scores of business heads have adopted the Voluntary Pay-roll Allotment Plan as a simple and easy way for every worker in the land to start a *systematic* and *continuous* Defense Bond savings program.

Many benefits . . . present and future. It is more than a sensible step toward reducing the ranks of the post-war needy. It will help spread financial participation in National Defense among all of America's wage earners.

The widespread use of this plan will materially retard inflation. It will "store" part of our pyramiding national income that would otherwise be spent as fast as it's earned, increasing the demand for our diminishing supply of consumer goods.

And don't overlook the immediate benefit . . . money for defense materials, quickly, continuously, *willingly*.

Let's do it the American way! America's talent for working out emergency problems, democratically, is being tested today. As always, we will work it out, without pressure or coercion . . . in that old American way; each businessman strengthening his *own* house; not waiting for his neighbor to do it. That custom has, throughout history, enabled America to get things done *of its own free will.*

In emergencies, America doesn't do things "hit-or-miss." We would get there *eventually* if we just left it to everybody's whim to buy Defense Bonds when they thought of it. But we're a nation of businessmen who understand that the way to get a thing done is to *systematize* the operation. That is why so many employers are getting back of this Voluntary Savings Plan.

Like most efficient systems, it is amazingly simple. All you have to do is offer your employees the convenience of having a fixed sum allotted, from each pay envelope, to the purchase of Defense Bonds. The employer holds these funds in a separate bank account, and delivers a Bond to the employee each time his allotments accumulate to a sufficient amount.

Each employee who chooses to start this savings plan decides for himself the denomination of the Bonds to be purchased and the amount to be allotted from his wages each pay day.

How big does a company have to be? From three employees on up. Size has nothing to do with it. It works equally well in stores, schools, publishing houses, factories, or banks. This whole idea of pay-roll allotment has been evolved by businessmen in cooperation with the Treasury Department. Each organization adopts its own simple, efficient application of the idea in accordance with the needs of its own set-up

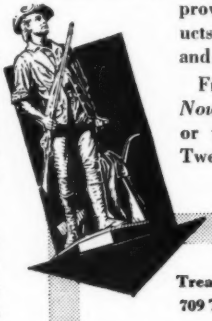
No chore at all. The system is so simple that A. T. & T. uses exactly the same easy card system that is being used by hundreds of companies having fewer than 25 employees! It is simple enough to be handled by a check-mark on a card each pay day.

Plenty of help available. Although this is *your* plan when you put it into effect, the Treasury Department is ready and willing to give you all kinds of help. Local civilian committees in 48 States are set up to have experienced men work with you just as much as you want them to, and no more.

Truly, about all *you* have to do is to indicate your willingness to get your organization started. We will supply most of the necessary material, and no end of help.

The first step is to take a closer look. Sending in the coupon in no way obligates you to install the Plan. It will simply give you a chance to scrutinize the available material and see what other companies are already doing. It will bring you samples of literature explaining the benefits to employees and describing the various denominations of Defense Savings Bonds that can be purchased through the Plan.

Sending the coupon does nothing more than signify that you are anxious to do *something* to help keep your people off relief when defense production sloughs off; *something* to enable *all* wage earners to participate in financing Defense; *something* to provide tomorrow's buying power for your products; *something* to get money *right now* for guns and tanks and planes and ships.



France left it to "hit-or-miss" . . . and *missed. Now* is the time for *you* to act! Mail the coupon or write Treasury Department, Section A, 709 Twelfth St. NW., Washington, D. C.

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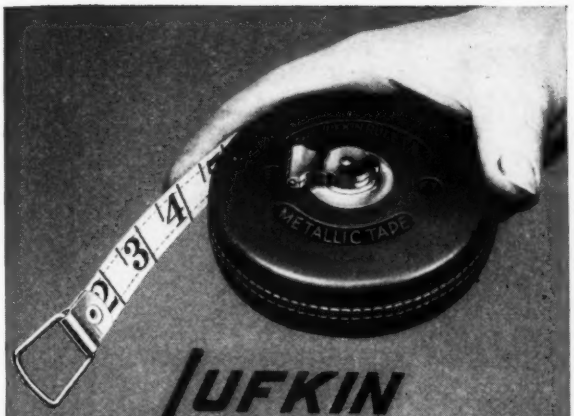

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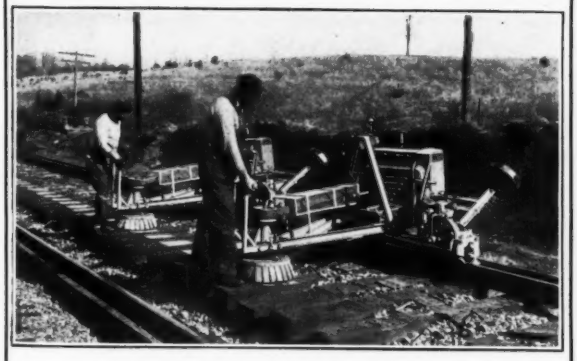

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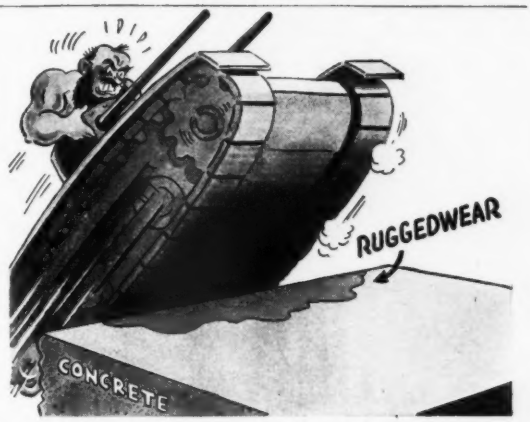

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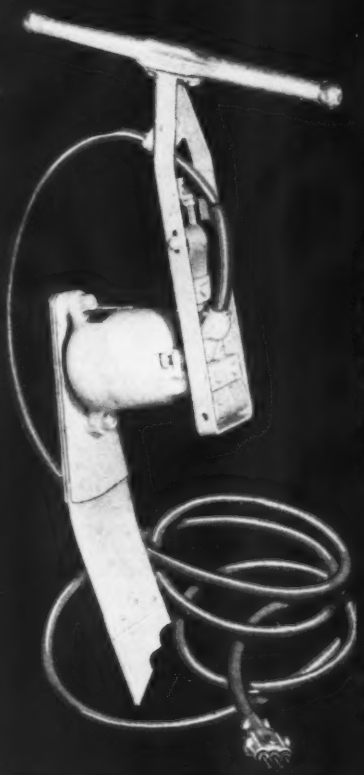

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